. 143, No. 2 August, 1935 Price 25c

AMERICAN GAS JOURNAL

An historic installation! One of the first group of Nordstrom Lubricated Plug Valves ever installed by the gas industry.

Photo of Nordstrom Lubricated Valve installed 15 years ago on outlet of high pressure holder supplying city distribution main in a California city. No repairs to date. In constant use.

IN SERVICE
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YEARS
and no repairs to date
NOT A SINGLE PENNY SPENT FOR REPAIRS OR SERVICE

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As a result of the performance of this Valve and others of the same group, a large West Coast gas company standardized on Nordstrom Valves for its gas distribution system. Others followed suit, and the valve pictured above became the forerunner of several hundred thousand Nordstrom Valves now in service on artificial and natural gas lines. We know that at least 99% of all Nordstrom Valves that were ever installed on gas lines are still in service and will remain in use indefinitely, and that even the oldest of these are as efficient today as they were in 1920.

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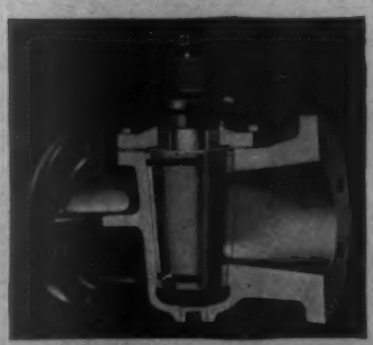

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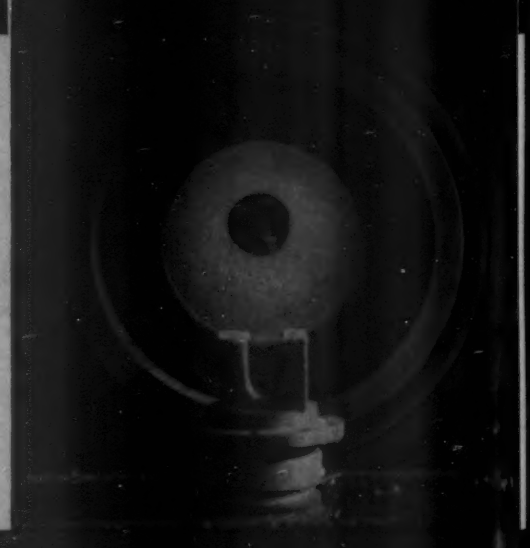

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Foundries and Sales Offices throughout the United States

AMERICAN GAS JOURNAL

Established 1859

AUGUST 1935

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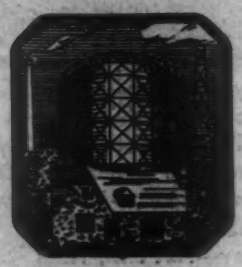

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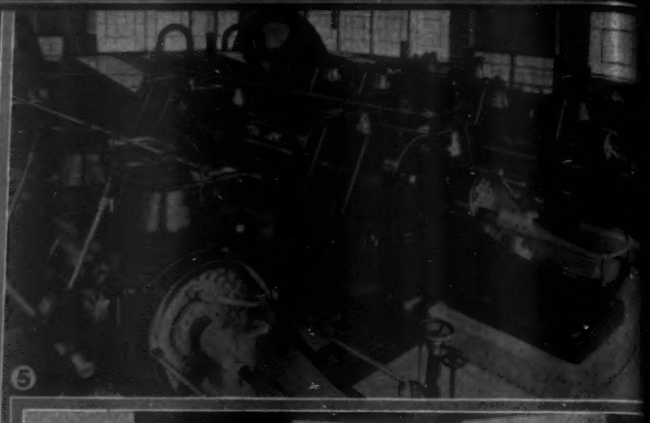
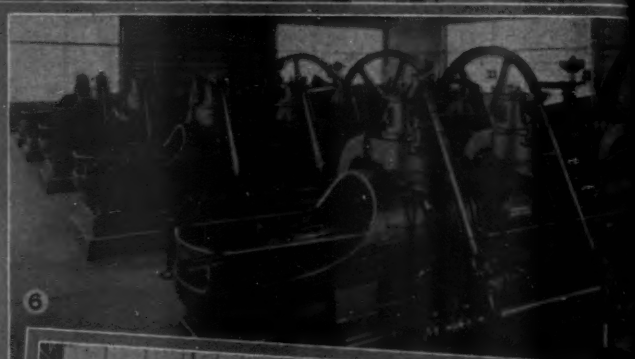
COOPER-BESSEMER
CHOICE ON THE NATION'S





1. Industrial Fuel Supply Company—Ventura, California
2. Pacific Gas & Electric Company—Kettleman Hills, California
3. Mississippi River Fuel Corporation—Star City, Arkansas
4. Carbide & Carbon Chemicals Corporation—Diamond, West Vir
5. Southern Natural Gas Company—De Armanville, Alabama
6. Ohio Fuel Gas Company—Medina, Ohio
7. Western Gas Company—Fort Bliss, Texas
8. Peoples Gas Light & Coke Company—Chicago, Illinois

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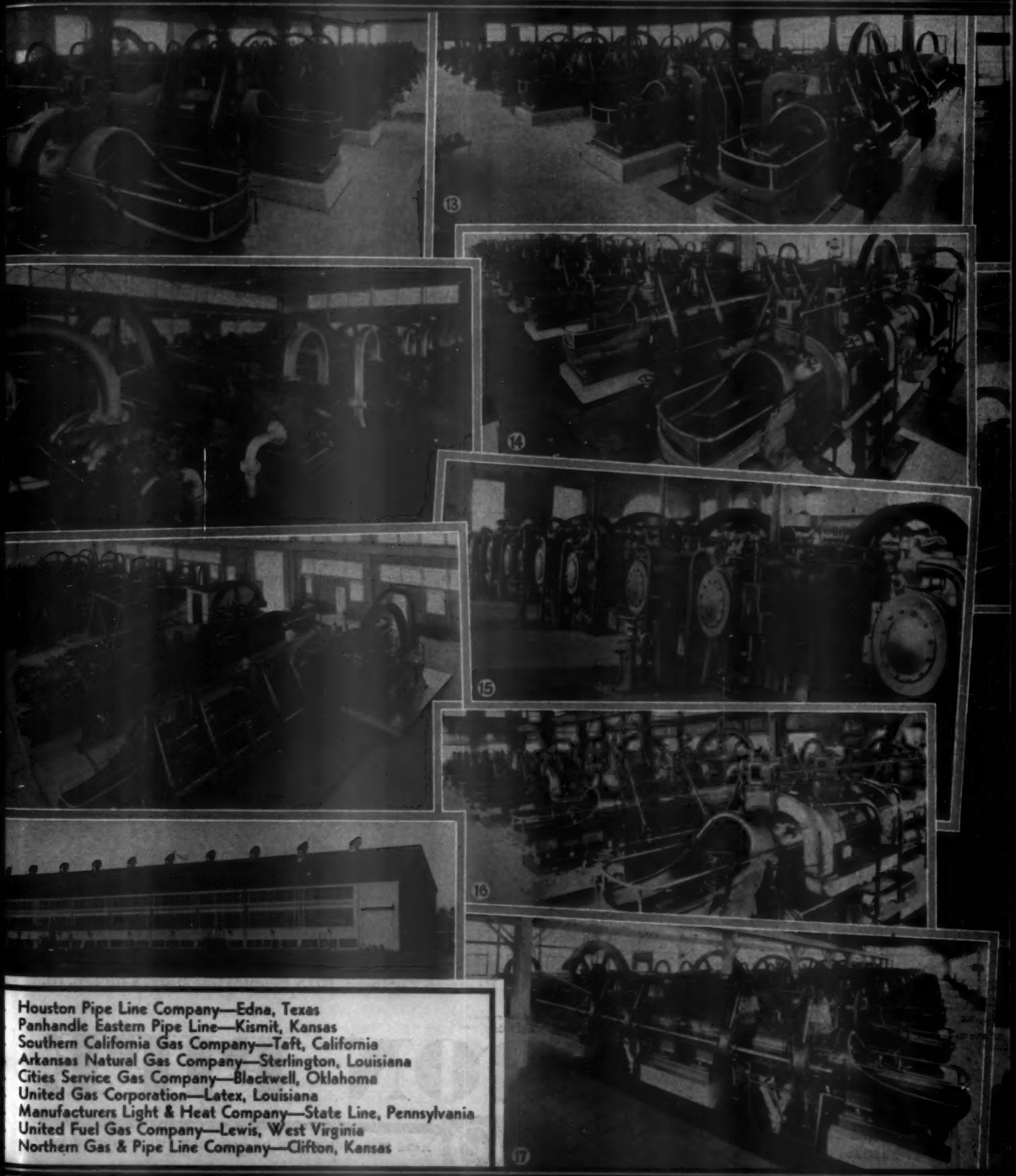

Houston Pipe Line Company—Edna, Texas
Panhandle Eastern Pipe Line—Kismit, Kansas
Southern California Gas Company—Taft, California
Arkansas Natural Gas Company—Sterlington, Louisiana
Cities Service Gas Company—Blackwell, Oklahoma
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CAST IRON PIPE

METHODS OF EVALUATING BIDS NOW IN USE BY ENGINEERS RATE THE USEFUL LIFE OF CAST IRON PIPE AT 100 YEARS

AS THE EDITOR SEES IT

Unethical and Stupid

IN the Congressional Investigation of efforts of the utilities to influence legislation, following the defeat in the House of Representatives of certain of the more destructive provisions of the Wheeler-Rayburn bill, evidence was produced indicating a regrettable departure from ethical standards by representatives of one holding company. The attitude of our industry in general was made clear by Philip H. Gadsden, Chairman of the Committee of Public Utility Executives, on July 17th in the following statement:

"If subsequent evidence confirms the accusation that representatives of a utility holding company have sent out fake telegrams opposing the Public Utilities Bill, the Committee of Public Utility Executives condemns such action as dishonest just as strongly as any other group in the United States. The company to which this action is attributed is a subsidiary of the Associated Gas and Electric Company. The Associated Gas and Electric Company is not a member of the Committee of Public Utility Executives and has had no connection whatsoever with it. It is, to say the least, unfortunate that representatives of any company should so depart from the standards set by the utility industry in general. It is acts like this committed by a small number of companies which have brought discredit upon the industry and which have made it necessary for us to come to Washington to defend ourselves against a bill seeking to destroy us.

"From past experience, the Committee of Public Utility Executives is aware that the sponsors of this bill will endeavor to imply that isolated cases of this kind are typical of the industry as a whole. But the public protest against the destructive features of this bill is far too genuine and widespread for anyone to attempt to pin any label of falsification upon it.

"The Committee of Public Utility Executives will continue its activities as openly and as honestly as before and will oppose as strongly as ever any practices that depart from the highest ethical standards."

With the above attitude the JOURNAL is in most hearty accord.

While investigating efforts to influence legislation the Congressional Committees would do well to be equally painstaking in searching out and merciless in publicizing and condemning any acts of administrative officials of the government in seeking to usurp or control the functions of the legislative branch.

Self Regulation of Industry

IT was the sincere expectation of many that industrial chaos follow the decision of the United States Supreme Court overthrowing NRA. Regardless of its constitutionality most business men admit that certain of the basic objects of NRA were sound; but even before its final demise it was quite generally admitted to be a failure, in part probably because of lack of flexibility and in part because of politics.

The expected chaos has not yet developed. In an informal way most businesses have sought to regulate themselves. For example, no gas company so far as we know has made any change in wages or working conditions.

But industry has gone further. In at least one notable instance it has proved that it could regulate itself successfully in a more formal way without advice or interference from any government bureau. Appalachian Coals, Inc., has been doing this during the past two and a half years in a logical, practical and constitutionally proper manner. Its "Plan" was approved by the United States Supreme Court in March, 1933.

Six months before NRA was proposed Appalachian Coals, Inc., was organized as a selling agency with power to stabilize prices and regulate trade practices. Indirectly this resulted in stabilization of wages also. It has recently handled over seventy per cent of the coal produced in eastern Kentucky, eastern Tennessee, southern West Virginia and Virginia, this representing about one-sixth of all the coal mined in the country. Both because of its policies and its position this organization has become a leader in showing how private industry can succeed where governmental efforts have failed.

Sales per Meter

THE biggest problem of the gas operating company today is the acquisition of additional business and particularly the building up of sales per meter.

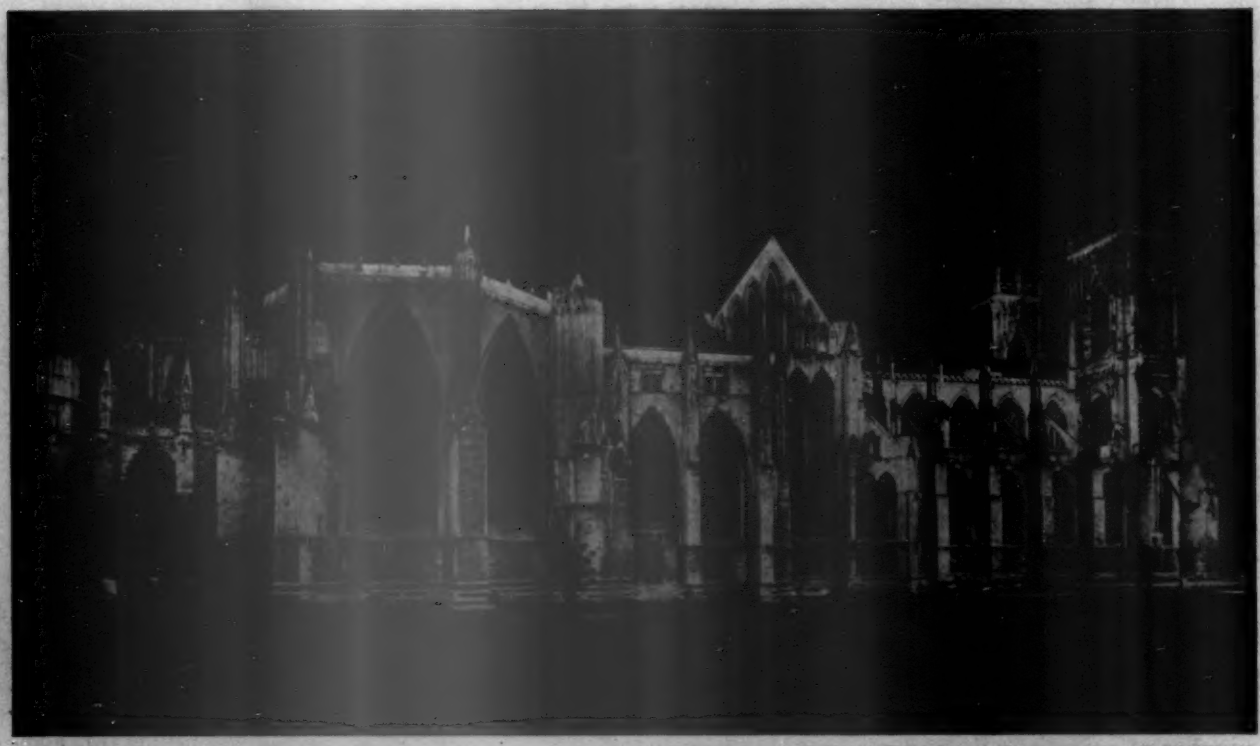
It was natural that the depression should bring about a decrease in sales per meter as well as in the number of meters in use. More recently the industry has regained a substantial percentage of the customers whom it lost, but sales per customer have failed to keep pace.

We might just as well face the situation squarely. Competition from electricity and other fuels, entirely apart from action of the regulatory authorities, is going to make low rates a necessity. But low rates can be profitable only with high sales per meter. Therefore, we express our opinion that the building up of sales per meter is the greatest problem of the gas operating company today; and therefore the JOURNAL for some months past has been urging the industry to study the "Objective Rate Plan" and other similar rate applications which have for their purpose the building up of sales per meter, the automatic reduction of rates as this is accomplished and the protection meanwhile of the revenues of the company.

Explanation is not lacking of why sales per meter have failed to show greater improvement. Improved efficiency of appliances, loss of some business to other fuels and changed habits of the people are variously cited.

With respect to the latter, less and less cooking is undoubtedly being done in the home. As a partial offset to this an added commercial cooking business is probably available. On the other hand the use of hot water and refrigeration in the home is on the increase and the public is becoming more and more conscious of the comfort of automatic house heating. In these fields the changing habits of the people should be turned to our advantage.

We cannot increase sales per meter by talking about the good old times when gas was used for lighting in flat flame burners. We had no gas stoves then, and in at least one city bath-tubs were against the law. We must adapt ourselves to conditions as they exist today, and do it a little better than the other fellow.

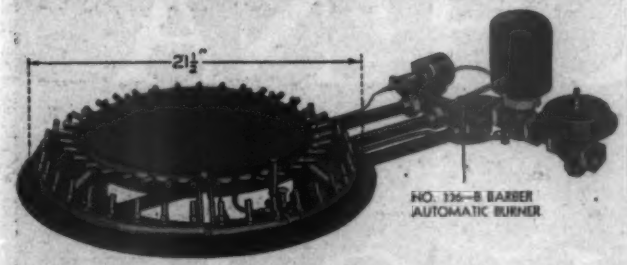


A Beautiful Example of Gas Floodlighting

Many members of our industry who have visited England will remember with affection the York Minster. During the recent Jubilee Celebration, The York (England) Gas Company undertook the floodlighting of this beautiful edifice. These two photographs in themselves tell of a worthy task well done.

• *The Trend of the Times* •

is to BARBER BURNERS!



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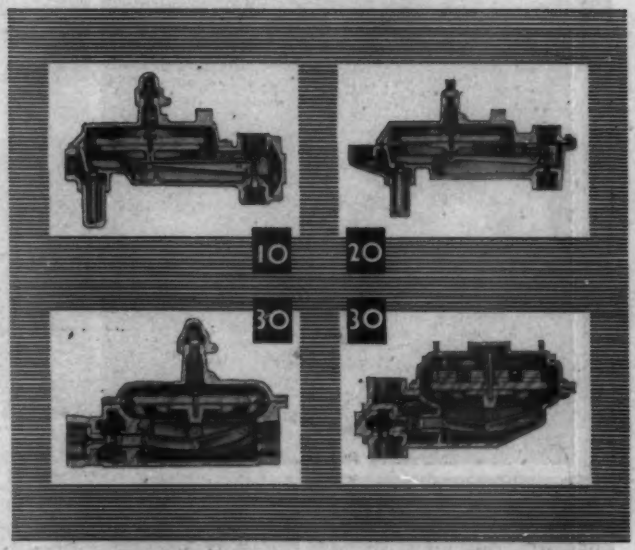

Illustrated, Cross-sectional views of: Models 10, 20 and 30. Model 30 is shown in spring and dead weight.

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MODEL 10—*Dead Weight or Spring Type,* with or without Mercury Seal, or Dead Weight Safety Seal. All working parts are so accessible as to be interchangeable without removal from pipe line.

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AMERICAN GAS JOURNAL
AUGUST 1935

Flash System Of Carbureting Gas Continuously Generated From Solid Fuel

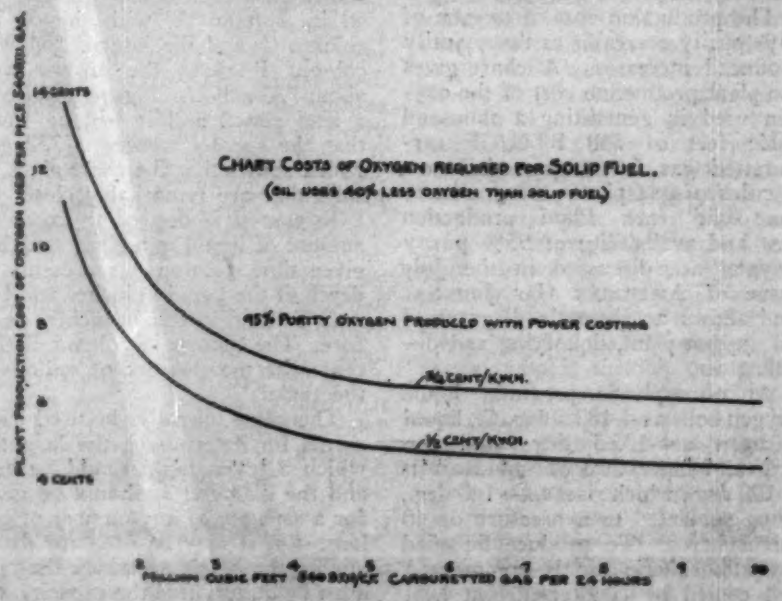
By THEODORE NAGEL
V. Pres. and Chief Engr. Carburetted Gas, Inc., New York

IN the current practice of generating carburetted water-gas from coke, steam and oil by the alternating "blow" and "make" intermittent gas operating cycle in a three shell gas machine the "blow" period of each recurring cycle supplies, to the carburetor and super-heater chambers, heat that is used during each "make" period to heat the water-gas and oil to the carbureting temperature and also provides the energy required for cracking the oil to fixed gaseous hydrocarbon enrichment of the water-gas.

During the time it is subjected to heat while flowing through the two chambers, the oil is converted to the lighter weight gaseous hydrocarbons, and polymerizing reactions convert part of the gaseous hydrocarbons to light oil and tar condensates owing to prolonged heating. Throughout the "make" periods the atomized oil is subjected to continually falling superheat temperatures and the water-gas generator is also gradually cooled. This intermittent carburetted water-gas operating cycle provides auxiliary means of gas superheating for carbureting the water-gas through alternating "blow" periods that supply the heat used during the "make" periods.

In the flash system for lean-gas enrichment, which operates at substantially even carbureting temperature, practically all the hydrocarbons of the oil (gas-oil and oil heavier than gas-oil) can be cracked to fixed gaseous hydrocarbons inhibiting the formation of light oil and tar condensates.

The flash system of carbureting, a patented process, consists in supplying a part of the required energy for converting oil to fixed gas through heating the liquid oil subjected to superatmospheric pressure while flowing through a pipe coil heater. The lean-gas to be enriched is generated at an even temperature substantially in excess of its car-



bureting temperature and this excess heat supplies the energy deficiency required for the flash system of carbureting in which the hot oil is converted to fixed gaseous hydrocarbons through convection by gas diffusion upon flashing the hot oil into the hot lean-gas.

Carbon monoxide hydrogen gas can be continuously generated at any desired substantially even temperature considerably in excess of the required carbureting temperature by using 95% purity oxygen and steam with solid fuel (coke, anthracite and / or bituminous coal) in a single shell gas producer.

Through the flash system of carbureting, injecting hot oil into even temperature hot lean-gas, carburetted gas can be generated in a continuous process at a substantially even carbureting temperature to convert practically all the hydrocarbons of the oil to enrichment gas, to inhibit the formations of light oil and tar condensates and to eliminate the usual auxiliary gas superheating operation.

The production cost of generating a thousand cubic feet of 540 BTU/CF carburetted gas by this continuous process can be computed from the local costs of operation and gas materials. The materials quantities are:—

Coke .....24 pounds
Oxygen .....325 cu. ft.
Heavy Oil ....2.67 gallons

When bituminous coal is used in place of coke 32 pounds coal and 220 cu. ft oxygen are used and less enrichment oil is required because fixed gaseous hydrocarbons, formed from the cracked volatiles of the coal, partially enrich the lean-gas.

The production cost of oxygen of 95% purity decreases as the quantity produced increases. A chart gives the plant production cost of the oxygen used in generating a thousand cubic feet of 540 BTU/CF carburetted gas. for various daily capacities of gas plants using coke as the solid fuel. Plant production cost and availability of 95% purity oxygen are discussed in the July issue of American Gas Journal and shows a schematic diagram of an oxygen plant, liquefying and distilling air.

At atmospheric pressure, liquid oxygen boils at —182.5 deg. C., liquid nitrogen at—195.5 deg., and the critical temperature of liquid air is —190 deg., which rises to —140 deg., when subjected to a pressure of 40 atmospheres. To produce liquefied air, atmospheric air is compressed and cooled by counter-current heat transfer to the cold oxygen and nitrogen gases exhausting from the fractionating column and then, through mechanical expansion, the air temperature is lowered and subsequently dropped below its critical temperature by heat transfer to the intensely cold liquid air, the temperature of which is thereby raised above the boiling point of its nitrogen component which passes off as a vapor and leaves liquid oxygen which is then vaporized. Commercial production of oxygen is a simple continuous automatic operation, the oxygen plant being so designed that technical knowledge of the physics involved is not required of the operator. The operating attendant merely regulates valves according to operating instructions and as indicated by dial instrument readings.

The article in the July issue also describes the use of heavy oil and oxygen for continuous generation of carbon monoxide hydrogen gas that contains the heat energy deficiency required for enrichment with hot oil by the flash system of carbureting. Generating city gas of 540 BTU/CF with oil and oxygen (without using solid fuel), the cost of oxygen will be only sixty percent of the costs shown on the chart because less oxygen is required with oil for generating carbon monoxide hydrogen gas.

How Many Gallons in Any Vertical Cylindrical Tank?

The accompanying chart answers the above question for any height from 2 inches to 600 inches, (50 ft.), and for any diameter from 3 inches to 1000 inches, (83 1/3 ft.).

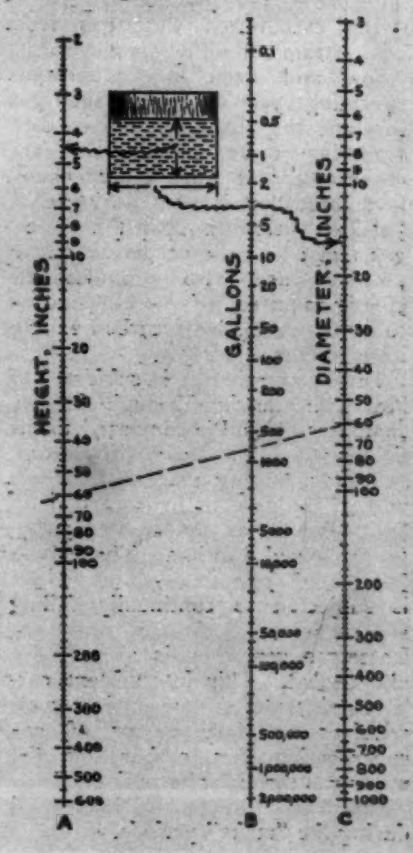
To use the chart, simply run a straight line across connecting the height of the tank (column A) with its diameter (column C) and the intersection with the middle column (column B) gives the gallons instantly.

For example, if we have a tank 60 inches in height and 60 inches in diameter, what is its capacity? The dotted line drawn across the chart shows how it is done. Connect the 60 in. column A, with the 60 in., column C, and the intersection with column B gives the answer as—about 730 gallons. Figure it out with a lead pencil and it will be found that the correct answer is 732 gal., which shows that the chart gives results that are remarkably close.

In case it is desired to know the amount of liquid in a given tank at a given time, column A represents the depth of the liquid in inches and Column C the diameter in inches, as before. The figures in column B then represent the number of gallons in the tank.

The chart may also be used backwards for determining the height to which a given tank should be built and the diameter it should be given for a capacity of any number of gallons. Or, it may be used for determining the height to which the tank must be built where the capacity and diameter are both fixed. In other words, where two of the factors are known the third is easily found by means of this chart.

As will be noted, the maximum capacity of the chart, column B, is 2,000,000 gallons.



The Importance Of Record Control To Executive Management

Part II

By

Henry J. Johnson

Manager, Public Utility Sales Division
Remington Rand Inc.
Buffalo, N. Y.

Elimination of Waste

IT is impossible even to estimate the tremendous waste caused by recording and keeping data properly classed as "useless information." The usual reason given for the existence of certain records and reports is "We have always done it that way." If we are to progress we must be willing to junk old pet ideas and methods and try something new. One of our outstanding national leaders recently described the junking of old equipment and methods as "Constructive Waste" and another has declared that the progress of any organization can be measured by the size of its junk pile.

Filing Control

It is difficult to imagine any condition more aggravating than not being able to locate the necessary records and information when wanted. Yet, it probably happens oftener than any other one thing. Lost and mis-filed records are nearly always the result of inadequate consideration and thought given to the housing, filing and indexing. The expression "I can't remember what subject I filed it under," is a very common one. This is usually due to the fact that the whole burden of responsibility for deciding on filing subjects and determining where certain material should be filed, is placed on the filing clerk. It is just as important to develop a chart of subjects for filing as to have a chart of accounts for the general ledger.

Perhaps the most serious charge of all is that most of the records in use today have been designed entirely from the departmental viewpoint, rather than from the viewpoint of what is best for the organization as a whole. It is usually the desire of every department to feel entirely independent of every other department. It is unfortunate that this attitude exists, because every individual who is guilty of it is cheating himself out of the opportunity of becoming familiar with the operation of his organization from every angle. We must be able to overlook departmental lines and consider every problem from the standpoint of the entire company's welfare. I am convinced that one of the greatest evils existing in American business today is jealousy among departments and individuals, because it causes each department to disregard the welfare of every other in order that they may be entirely independent of everyone else.

Designing Forms

The most essential factors in designing a form or record to insure the best possible results are, in my opinion vision, imagination, complete knowledge of the problem involved and an open mind. Just as the architect designing a building, the engineer designing a bridge, the artist painting a picture, or the author writing a book, must have a complete mental picture of the completed work, so must a person designing a form or record have a mental picture of the old system torn down and the new system designed, installed and working. This requires a very thorough knowledge of every requirement and an open mind. It means the subordination of all personal likes, dislikes and prejudices to the welfare of all concerned.

It has been said that the function of a good record system is the furnishing of information recorded thereon when it is wanted. I believe that it should go much farther than this. The system should be so designed and the records so filed that the information recorded is revealed when it is needed without a laborious search and hunt for it.

Standardization of Forms

Just what may be accomplished by standardizing and properly controlling the printed forms and the necessary organization for handling them? As a conservative estimate the number of forms in the average organization can be reduced at least 35 percent.

Records prove that the actual reduction in a large number of organizations has been much greater than this. I will, however, mention only two or three.

One prominent gas and electric company recently made an analysis of the consumers bill forms in their various properties and found that they had 143 designs which were reduced to 36. There were 78 different sizes which were reduced to two. There were 89 different kinds of papers which were reduced to two. There were nine different colors which were reduced to two. The annual cost of the old forms was $22,531.00. This cost after the standardization was reduced to $9,068.00, a saving of 60 percent or $13,463.00 per year. The same organization discovered that they had 104 stock forms in 35 different sizes, 7 different colors and 10 different grades of paper, which were reduced to one.

We recently made an analysis of the card files of an organization and found that they had 235 different sizes, colors, kinds and grades of paper which were reduced to about 10 or 12. Perhaps these cases all seem to be a bit extreme, but as a matter of fact they are typical of hundreds that have come to our attention. The reasons for these conditions are that when a form is needed, it is originated in the department, drawn up by some clerk or possibly the department head, a printer is called in and asked to submit prices and paper samples. The person who is making the decision feels of the paper and decides on one that seems to be about the kind and grade that he had in mind and places the order. No thought is given to the actual requirements of the record, the method of filing, indexing and the kind of usage that the forms will receive. The average requisition for reprinting forms speci-

fies "same as last." The purchasing order is made out to the lowest bidder who found a cheaper paper and the forms come in showing a saving in the cost of paper, but the potential loss in efficient service is sustained every time this form is used. Modern efficiency standards demand that each form, ledger sheet and card index be analyzed to determine its service requirements and the exact paper specifications worked out.

Systems and Planning Department

We are now confronted with the problem of how existing conditions can be corrected and a repetition of them avoided. In a moderate size organization the responsibility for proper standardization and approval of forms may be assigned to one of the executives. In a larger organization it is usually advisable to set up a committee or a department known as the Systems and Planning Department. In order to start the activities of such a Committee or Department properly a complete survey and analysis should be made of the existing forms by someone thoroughly experienced in the work, who will make recommendations to this Committee covering all necessary changes, set up standard printing specifications covering each individual form, as well as procedure and specifications to be followed by the Committee in approving new forms submitted to them.

Authorizing New Forms

The department originating a form should prepare a formal application to the Systems and Planning Department for their approval. The following questions should be answered on the application:

What is the form to be used for?

Is it temporary, semi-permanent or permanent?

Will the usage be mild, normal, rough or abusive?

This information will make it possible to determine the grade and weight of paper to be used. Forms to be used one year or less are classed as temporary. Forms used from one to five years are classed as semi-permanent and forms that will remain in service indefinitely are classed as permanent. The kind of treatment which the forms will receive is of utmost importance in determining whether all sulphite, a partial rag content of a 100 percent rag stock should be used.

Analyzing Form Requirements

If the form is to be hand written, horizontal lines should be provided. If it is to be typewritten no horizontal lines should be provided, but indication marks for insertion and registration in the machine should be used. The form should be spaced 10 to the inch horizontally and 6 to the inch vertically in order to eliminate the necessity of adjusting the form a fraction of space.

Cheaper paper can be used if the form is to be typewritten than if pen and ink are to be used. Special attention should be given to the arrangement of the various spaces so that tabulator stops may be used on the typewriter in order to avoid the necessity of hand setting the carriage.

If the form is to be filed in visible equipment, special attention should be given to the visible margin and space must be provided for transfer filing after it has been removed from the active file. If the form is to be housed in a vertical file special attention should be given to the location of the symbol or heading by which it is indexed, also to the size of guides, folders and filing equipment to be used. If it is to be filed in loose leaf binders, consideration must be given to size of the binding margin and the type of punching to be used.

Binders

All types of binders have some advantages and some disadvantages. Post binders are not entirely satisfactory if frequent removals and insertions are to be made in various places in the book. The tong binder is the most satisfactory from a standpoint of flexibility and ease of handling and the absence of projecting posts makes it possible to stack binders of this type and they may be used on desks or counters without injury to the surface. Ring binders should only be used on small size forms and where the activity and reference to the record are very limited.

It is important that the symbol or other designation by which forms are sorted and arranged be placed in a convenient position for this purpose.

The form being replaced should be carefully analyzed to determine that provision has been made on the new form for all necessary information. The old form should then be definitely placed out of service and any existing supply destroyed.

All forms that are filed together should be of uniform size in so far as possible and all information that may be posted to another record should be carefully grouped.

Frequently an excess number of copies are provided whereas by proper planning one copy may be routed to two or more departments. Multiplicity of copies not only increases the cost, but the filing space required. It is also suggested that routing and operating instructions be printed on each individual copy and each copy should be made distinctive either by the color of the paper, the color of the ink or in some other effective manner.

Nearly all forms can be reduced in size and effect savings in cost of forms, filing space and handling. Special attention should be given to having all forms printed in standard sizes in order to fit binders, filing cabinets, guides and folders of standard size and cut out of standard size paper stock. The average printing bill can be reduced 10 percent by special attention being given to this very important factor.

Consulting Departments

If the form originates in more than one department special attention should be given to the elimination of unnecessary rewriting and transcribing and departments so affected should be consulted in order to determine that their requirements have been fully met in every respect.

Every department to which any copy of the form is routed should be consulted to determine that all information required is provided and in the most convenient manner for their purpose. If certain information which is of no interest to various departments is likely to be confusing, special blocking out designs should be used in order that the desired information may be made more prominent. All related information should be carefully grouped.

Requirements should be carefully determined. A tremendous waste occurs in the average organization through the ordering of a larger quantity than is needed. Sometimes the revision of a form is delayed for a long period of time in order to permit the existing supply of forms to become exhausted.

The relation of clerical labor cost to the cost of office forms, supplies and equipment is 30 to 1. That is, for every dollar spent for office equipment and supplies $30.00 is spent for supervisory and clerical salaries. This fact emphasizes in no uncertain terms the extreme importance of designing and selecting the forms and equipment that will provide the greatest possible efficiency and consequently effect reduction in clerical labor cost.

Industrial Men Consider Commercial Gas Load at Boston Meeting

THE immediate necessity for market analyses and surveys to maintain and increase the commercial gas load proved to be the keynote of the first Commercial Gas Sales Symposium held under the auspices of the General Commercial Committee of the Industrial Gas Section of the American Gas Association at Boston, Mass., June 26, 1935. Among the some hundred engineers in attendance were representatives from Detroit, Toronto, Knoxville, New York, Philadelphia, Syracuse, Chicago, Newark, Boston and other New England cities.

The meeting disclosed a recent and astonishingly acute interest in the almost forgotten commercial gas sales field. Discussion brought out that while this is one of the most profitable loads on the gas utility lines it has been the most neglected. Only in the past two years has any real interest been shown and this has uncovered a surprising and valuable array of facts.

The need for a list of manufacturers of different kinds of commercial gas appliances in various commercial fields was stressed. Geo. Segeler, Industrial Engineer, a member of the A.G.A. Staff, stated that such a list had just been compiled and would be mailed out shortly.

The meeting was opened by H. A. Sutton of the Public Service Electric and Gas Co., Chairman of the General Commercial Gas Sales Committee, and the delegates were welcomed by F. D. Cadwallader of the Boston Consolidated Gas Co. The first paper on "The Commercial Gas Load: What It Is and What It Means to the Gas Company," by F. H. Trembly, Jr., of the Philadelphia Gas Works Co., proved to be of outstanding interest. Mr. Trembly said in part:

"The commercial load consists of two parts, hotel and miscellaneous, otherwise described as the known and the unknown, the secure and the insecure. The hotel and restaurant load, thanks to strong utility support and a proper sales philosophy, may be considered in most cases secure against competitors. The miscellaneous commercial load was developed through convenience without utility cooperation. There is no general understanding of this gas load as to its development or protection. The days of safe indifference are gone. The utilities must either take the same interest and activity in this field as they have in the hotel and restaurant field or be prepared to lose a considerable portion of this gas load."

Roy E. Wright of the New England Gas & Electric Company in his paper "The Market—The Sales Policy," said "Most of the customers in the commercial field are relatively small users, consuming on an average of 5 to 35 MCF per month. Their gas bills are based on the higher rate blocks and therefore provide an attractive and profitable business." After breaking down the market into a long list of widely varying users, he went on to say, "there are three other uses for gas that can be applied to practically every type customer in the above group, namely, summer air conditioning, gas lighting and space heating. The gas utilities should assist in developing the summer air conditioning gas load as any delay in pioneering this field would serve to secure it for the electric industry. We can well afford to follow the lead of the electric companies who are doing a fine job in building up this load. It will cost money to get started and develop this field and specially trained men are required. A sales engineer assigned to this task cannot be expected to pay his way for at least a year or two. As to gas lighting there are indications of a comeback but this is to date confined to flood lighting of commercial establishments."

The dwindling of the gas load among tailor shops was combatted in Mr. Wright's territory by servicing the boilers as follows: cleaning tubes, reducing secondary air intake, draft hood diverter in flue, insulation and burner adjustment. A saving of 25% on fuel consumption was effected, Mr. Wright further stated.

"Our analysis of tailor shops has convinced us of the following facts:

1. That it is not wholly a question of rates. Equitable rates should be filed, but we cannot hope to have rates low enough to meet competitive fuels on a cost basis.

2. Very few tailors are making any money. There are too many tailors for all to make a profitable living. The small tailors have been severely affected by the reduced prices forced by the larger chain organizations.

3. Much good can be done by helping the tailor reduce his gas bill by increasing the operating efficiency of his gas equipment.

4. The average tailor does not like to use oil and is willing to pay a little more for gas.

5. Periodic contact will do much to retain this gas load. A man assigned to this work has secured the gas load in four tailor shops since January first."

Discussion revolved about surveys and survey personnel. Mr. Trembly stated that at Philadelphia one man had been assigned to cover 5000 tailor shops together with 4 service men. A crew of 6 or 7 men is preferable for a complete survey. About 8% of the total meters are in this field. As for steam boilers in tire retreading shops, those in the Firestone chain had changed from gas to oil.

In Syracuse a building to building survey was accomplished with three men taking data on both gas and electric possibilities according to Ralph Manier of the Syracuse Lighting Co. He thought the gas load could be held even with 70c gas.

An able analysis of the advertising possibilities and probabilities in the commercial field was presented by C. E. Lucke, Consolidated Gas Co., New York, in a paper "Advertising: What is Being Done." Much of the lost load of the gas utilities could have been saved by direct mail broadsides and newspaper advertising, he stated. There is an immediate need for a national advertising schedule in the trade magazines to combat the vicious and determined campaign our competitors are staging. Fantastic and misleading statements by the electric utilities are

backed up by favorable editorial comment on the part of editors disgruntled by lack of support from the gas companies.

"The A.G.A. National Advertising Campaign" was the name of paper read by J. P. Leinroth, Public Service Company of New Jersey. He announced that the committee of which he is chairman (Advertising Promotion Committee, Industrial Gas Section) has prepared in all its details, a direct by mail campaign to cover the field under discussion. Because of the vast number of classifications it is confined to the following five:

1. Hotels, restaurants, hospitals, clubs, etc.
2. Delicatessens and bake shops.
3. Tailor shops and pressing establishments.
4. Barber and beauty shops.
5. Counter food dispensing as in drug stores, etc.

Three mailing pieces already prepared on each of these classifications were shown. The orders for these direct-by-mail pieces should be placed through American Gas Association Headquarters, Industrial Gas Section, not later than August 30. The pieces ordered will be shipped on or before October 1 so that the entire industry in the United States and Canada can conduct this campaign simultaneously, making it a national, direct-by-mail Commercial Gas Sales Campaign. The committee is appealing to the gas industry to support this activity as its success is entirely dependent upon the cooperation of the individual gas companies.

A little pamphlet, "Commercial Heat" was presented by Fenton Kelsey as a medium for reaching commercial gas users. For its use he has developed the "formula of the common denomination, plus intelligent, local appeal, administered in such a way, from the standpoint of economies, that it can be persistent and consistent."

The afternoon session started with a paper "Cooperation With Manufacturers and Sales Agencies Handling Commercial Equipment" by W. W. Young, of the Connecticut Light & Power Co. He stated that there was "nothing new in the matter of cooperation in equipment design by the gas industry. Almost every gas company, at one time or another, has aided in the design of equipment. The A.G.A. has done valuable work in design, both in their fundamental research program and in their testing laboratories. We must realize, however, that the type of equipment under discussion probably needs more design aid from our industry than any other class." While rate reductions are a factor, he thought, that, in general, for that class of business, the money might better be spent for personnel. "That more might be done if we, instead of making a 10% rate reduction, took 10% of our gross revenue on that business and put it into personnel. The one cooperative point that I should like to stress is that the gas company should be interested in seeing that the equipment is properly installed and operating satisfactorily. The manufacturer is not always in a position to do this. Poorly installed equipment is an easy prey for our competitors."

As for the load from the beauty parlors, during the past few years, manufacturers of the gas system hair dryer have furnished the gas companies with roughly 100,000,000 cu. ft. per mo., based on the installation of about 15,000 system dryers, of an average of five helmets or hoods each. This information was vouschafed by W. V. Sullivan, of Halliwell, Inc., in his paper "The Manufacturers Viewpoint." He went on to say that this load accrued to the gas companies with very little effort on their part, because the manufacturers undertook all of the pioneering and educational work in conjunction with the beauty shop equipment jobbers and dealers. The fact that there are approximately 75,000 beauty parlors in this country shows that this is still a fertile field for the gas utilities.

All of the men in the industrial division of the Brooklyn Union Gas Co. were temporarily switched into the commercial field because of the decline in gas sales according to R. H. Staniford, Brooklyn Union Gas Co., speaking on the "Development of Modern Equipment and New and Additional Uses for Gas in the Commercial Field." "Covering those customers which represented the largest numbers as to class and the largest customer in sold gas, some 900 have already been contacted. We found out a lot of things among others that of the 600 restaurants surveyed, 60% used gas for water heating and the vast majority of the others employed building steam or central heating hot water. The question is, why are we losing sales of gas in all lines of business, restaurants, butcher shops, beauty parlors and the rest of them? The one outstanding reason, as nearly as we could find out, is poor business. There appears to be a growing tendency to use oil for space heating and small steam boilers probably due to a desire on the customers part to economize. The people haven't the money to spend, and therefore they are not spending it on these particular types of appliances, as they did previously.

However, the survey brought to light many heretofore unknown possibilities which can be developed into lucrative business if the right appliances can be found or designed.

Trying to hold the customers already obtained, trying to keep them happily satisfied and make them feel happily satisfied has been, the past four years, the creed and work of C. E. Muehlberg, of the Consolidated Gas Company of New York, who spoke on the "Service and Maintenance of Gas Equipment in the Commercial Field." The servicing and maintenance of gas appliances by the gas company is vitally necessary in order to retain the old business and gain new customers because we are in a highly competitive field. Coal and oil companies are rendering this service in connection with their fuels. This increases the value of their fuels and has a tendency to decrease the intangible values of gas which we have always stressed when selling our fuel.

"As to the situation confronting our cleaning and pressing establishments, we have 10,000 pressing machines in our territory, the majority of which are equipped with the standard one horse power boiler. Competition and hard times made their gas bills a burden and these averaged $23 per month. Kerosene oil burners for these boilers made their appearance. Investigation to combat this revealed that by the insertion in each tube of the boiler of an inexpensive sheet metal strip, twisted into a gradual spiral, the boiler efficiency was increased by about 15%. Furthermore, most of these boilers were overgassed by about 50%. So we instructed our service men to clean the boiler, insert the spiral baffles, check the automatic control or try to sell one and get the gas consumption down around 90 cu. ft. per hour. Servicing 250 such jobs cost us on an average of $6 each for labor and material which was cheap compared with the revenue saved.

"We use the following guide in establishing the frequency of inspections for our industrial or commercial customers.

"All industrial customers using an average of 20,000 or over cubic feet of gas per month, for a year, as well as those customers using gas fired

power boilers, shall receive industrial inspections as provided under the following regulations:

1. All industrial customers whose yearly consumption is three million cubic feet per year or more, shall receive monthly inspections.

2. All industrial customers using Humphrey or similar direct gas-fired unit heaters for process or space heating shall receive monthly inspections during the periods used and quarterly inspections for the periods not in use, unless the gas consumption used on other appliances is at the rate of 250,000 cubic feet per month.

3. All newspapers shall receive monthly inspections.

4. All industrial customers using less than three million cubic feet per year, and more than 600,000 cubic feet per year, shall receive quarterly inspections.

5. All industrial customers using power boilers, or other automatic equipment—excepting only automatic copper storage water heaters— shall receive inspections no less frequent than quarterly.

6. All industrial customers using less than 600,000 cubic feet per year and more than 250,000 cubic feet per year, shall receive semi-annual inspections.

7. All other classes of industrial customers shall receive service on request, only."

In closing the meeting, Chairman Joseph E. Quinn, Brooklyn Union Gas Co., said, "I believe, in all sincerity, that the corner stone has been laid today in this Commercial Gas Sales Symposium."

"This morning, Mr. Leinroth, I think, covered the subject on this direct-mail campaign. Let me tell you that the Committee worked hard to get this campaign in shape, and I do hope that when you go back home, you won't do with this campaign what the industry did when we requested one-fiftieth of one per cent of their gross income on Commercial Gas Sales for national advertising. Around the first part of the year, a letter was sent to fifty gas companies, twenty-five natural gas and twenty-five manufactured gas, and those fifty gas companies represented sixty-eight and one-half per cent of the gas sales to commerce and industry. We asked them to subscribe one-fiftieth of one per cent of their gross income toward national advertising, and to give us an expression of opinion. I am glad to say that the manufactured gas industry very wholeheartedly supported this activity, but the natural gas industry fell back. Now, as Chairman of the Industrial Section, it wouldn't be fair for me to allow the manufactured gas industry to underwrite something that the natural gas industry did not want. But, I am firmly convinced that these conditions are all changing, and that next year—I hope—the gas industry will be more receptive to national advertising."

A Life Sentence For The Davis Brothers In Meter Maintenance

By Chas. N. Tunnell

THE patent medicine industry had its Smith Brothers; the automobile industry had its Dodge Brothers; the aviation industry had its Wright Brothers; and the gas industry yet has its Davis Brothers—three of them, John Richard, Robert E., and Patrick Davis. Good Irish names given by a mother and father from the old country—and proud of it to the Nth degree.

Ninety-nine years is a life sentence in most courts—and ninety-nine years has proven to be a life sentence for the Davis Brothers in the gas and gas meter maintenance business. Each of the three has devoted his entire business life to date to this branch of the gas industry.

Although the history of the gas meter, dating back to 1815 when the wet meter was first invented, is known to most gas men, there are yet many who probably do not realize that proper meter maintenance means the difference between loss and profit—success and failure, for the gas distributing company. It cannot be said just how much money the Davis brothers have saved to the gas industry during their time, but it is evident that the figure would be stupendous. For John Richard Davis spent 41 years in the gas meter maintenance business before retiring several years ago; Robert E. Davis has spent the past 31 years in the meter maintenance field. He is now commercial manager and counselor for meter supervision for the Houston Natural Gas Company, of Houston, Texas, a position he has held since 1929. Pat Davis has spent 27 years in this business—he is now superintendent of measurements for the San Antonio Public Service Company, of San Antonio, Texas.

JOHN RICHARD DAVIS

To the Davis brothers and others of their type fell much of the work to educate gas company executives, stock holders, and the consumers to the proper understanding of gas meters. R. E. Davis, of the Houston Natural Gas Company, says this:

"As little as it might seem, proper registration of gas probably means more to the gas utility than any other single thing. Rates are not the controlling factor—for rates that will protect a profit have to be had. But gas which passes through a meter without being registered for the seller can never be reclaimed. And strange as it may seem, a slow registering gas meter not only cheats the company but it makes a dissatisfied consumer. Eventually the meter will be changed, and the customer will howl about an excessive gas bill. She is not being robbed as she thinks, but probably for the first time in years, she pays for the amount of gas actually used.

"It is not safe to depend upon the record of the gas bills to spot the inefficient meters. For often the inefficiency is so gradual, starting at one per cent or less and going on until it reaches seventy-five per cent, that the consumer's bill shows such a small decline over a long period of time that any recent comparisons do not reveal the inefficiency. Naturally the customer complains when the bill suddenly doubles—but the fault lays with the company in not making frequent enough tests, adjustments and reconditioning work to keep the meters registering accurately.

"Even though the correcting of a gas meter may bring a complaint—a deluge of complaints is preferred to red ink—and there was plenty of red ink on the books of gas distributing companies some few years ago when they gave less thought to meter maintenance. Some years ago, the banker and the other leading business men of the small cities would organize gas companies and start manufacturing and distributing gas. Things would usually go rosy for a time, the meters would become slow—and after a few years, from five to fifty per cent of the gas was not being accounted for through the meters.

"My brothers and I came into this field at that time and together with other fellows in the game, we worked to show these company executives that they must have accurate measurement or lose the public good will as well as any possibility of profit. We even went so far as to work out a plan some years ago where we would offer to re-condition the meters of a gas distributing company on a basis of accepting our pay from the increase in collections made possible by the repaired meters."

Many of the holding companies of today acquired some of their most valuable properties which at the

R. E. DAVIS

time of purchase were operating at a loss merely because the meter system was not in proper shape. These holding companies saw to it that the meter system was corrected—and they are not making the mistake today of falling into the habit formed by predecessors. The executives of the successful gas companies realize that they can no more operate at a profit with a system of meters not registering properly than a merchant can operate at a profit with his scales only registering half the weight of the commodities sold.

The part that the Davis boys have played in this all important phase of the gas industry is most interesting. For while it may have taken bankers, brokers, organizers, and big executives to put the gas business where it is today—a commonplace convenience available to all classes and usable for numerous purposes—it remained for the Davis Brothers and other maintenance men to show these executives how to get their rightful profit from this business.

PATRICK DAVIS

Just how they came to become a part of this industry, and their successive steps in it to make a total of ninety-nine years of service for this one family is best told as follows in Robert E. Davis's own words:

In 1893 a boy, John Davis, saw a sign on the gate at the "Gas Works" in San Antonio, Texas, reading "Boy Wanted," "See Mr. Brown." He applied and got the job. Mr. W. H. Brown an elderly gentleman, who had served his apprenticeship in meter making at the factory of Thomas Glover, London, England; Thomas Glover was the inventor of the present day dry gas meter. He later worked in the shops of Samuel Downs and Son, meter makers in New York, and had come to San Antonio to overhaul the meter system of about 3500 meters (65,000 meters now). He asked young Davis to remain in the shop while he went to town to get some additional material; while awaiting his return Little Johnny got to looking over some dismantled meters and decided he would not be able to master such complicated stuff and would advise the boss to get some one else. While still waiting his eyes rested upon some bright sheet tin and a pair of snips on a work bench, so he decided to amuse himself and began slicing up the sheet tin, making ducks, tin cups, and what-nots. When the Boss returned and saw what had happened to the nice bright tin, he proceeded with a heavy reprimand after which the youngster stated his decision to quit and his feeling of inability, but was told by Mr. Brown that anyone who could make such tin things without instructions, could surely go further with proper training, so he stayed on.

The foregoing could have been left out of this article but the purpose of mentioning it is to bring out the moral DON'T LET ANYBODY FOOL AROUND A METER SHOP NOT PROPERLY INSTRUCTED, THEY WILL DO DAMAGE.

When the San Antonio contract was finished, the pair covered the northern states together.

The traveling meter man became more in demand and in 1901, John Davis contracted to overhaul a meter system at Dallas, Texas, which then had a total of about 45,000 meters (now approximately 100,000 meters). After this job, he traveled throughout the southern states and while at Natchez, Mississippi, in

(*Continued on page 47*)

Gas Pressure Controls

INSTALLATION OF LINE REGULATORS

Part III

By

Erick Larson

Gas Engineer

Lighting Regulator Pits

IN practically all houses and in many regulator pits it is becoming customary to provide electric service for lighting. This is a recommended practice as it will increase safety, improve working conditions and increase both the quantity and quality of work. The permanently installed lights should be located where they will be most beneficial for general illumination and sockets should be provided for plugging in portable lights. The permanent lights should be located so as to avoid glare in workmen's eyes when working at the most frequent location which would be at the hand hole plates in the line regulator. All permanently located lights and plug sockets should be moisture and gas proof and every precaution taken to make all conduits and connections gas proof. It is preferable to have the meter fuses and cut-out switches at a location exterior to the regulator vault or room as an additional safeguard against gas ignition. A switch box inside a structure should be ventilated before opening or closing the switch for the box may contain an ignitable mixture even after the vault had been thoroughly purged.

Provisions for heating of a regulator are not ordinarily installed during the initial construction as it is difficult to predict whether trouble will be experienced with freezing. Where freezing may develop during the operation of a regulator sufficient space should be provided for the facilities required.

Heater Installations

Many heater installations have been in successful operation for a number of years such as open flame type of gas heaters, radiant fires, gas steam radiators and the overhead blower units together with small electric heaters located in close proximity to the body of the regulator where advantage may be taken of the reflected heat. The obvious disadvantage is the likelihood of ignition of any escaping gas. Installation of indirect heating units is recommended particularly for regulators in structures above ground. These units usually consist of a modification of hot air furnaces, the combustion chambers of which are located outside of the regulator room or if located in the room are sealed to prevent any direct contact between flame and any possible polluted atmosphere. A duct conducts the warm air to a chamber sometimes called drying hood or warm air chamber built around all or part of the regulator. The chamber around the regulator is usually only a tin box built in sections so as to be readily disassembled to provide access for inspection and repairs. To secure the greatest economy a thermostat is usually installed in the hood over the regulator which controls the main burner. The warm air type is the simplest to install and operate. A modification of this type is a hood built around the inlet pipe instead of the regulator to warm the gases before they reach the regulator. The length of hood required eliminates this method unless considerable space is available. With warm air heaters the combustion and the warm air chambers should be vented to the atmosphere. The venting of the drying hood is necessary to secure a good circulation of heat and also conduct off any escaping gas which might otherwise gain access to the combustion chamber. Besides being vented to the atmosphere the combustion chamber has an intake duct conducting air from outside the structure to the burner.

Steam Substituted

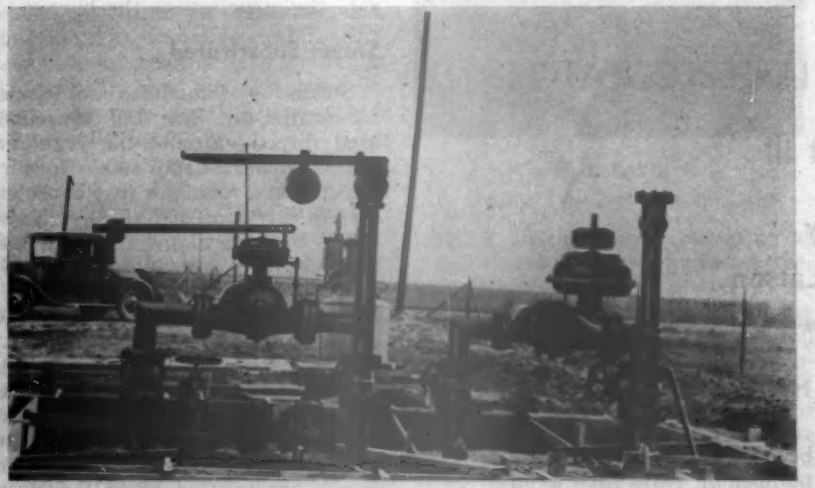
Steam is sometimes substituted for warm air heat but is seldom used directly around the regulator. The condensate from steam forming directly on a regulator may cause excessive corrosion and also by gaining access to parts of the regulator may interfere with operation. When the gas inlet pipe is surrounded by a chamber steam in place of hot water for heating will allow the use of a smaller sized chamber for equivalent results. The steam chamber is usually made steam tight and the condensate drawn off through a steam trap. The most direct and efficient results are secured when the steam may be injected into the gas itself on the inlet side of the regulator serving the double purpose of heating and saturating the gas where saturation is desirable. The difficulty in the use of direct injection into the gas stream is that controls must be installed so that an excessive amount of steam is not injected when the quantity of gas flowing is small as the excessive condensate would interfere with regulation. With the indirect methods the excess heat during the off peak periods would tend to increase the temperature of the gas which in itself would not be harmful unless it was sufficient to dry out diaphragms and valve discs or meters where nearby.

When the conditions producing freezing are not severe the injection of alcohol into the gas stream is often effective in eliminating trouble from freezing. The effect on B.t.u. value with the injection of alcohol or similar liquids may require investigation especially on systems feeding industrial consumers.

Overcoming Drop in Pressure

A large drop in pressure being one of the causes of freezing, a method sometimes used to overcome the difficulty is to install regulators in series and divide the total pressure drop between the two regulators. The distance between the two

regulators should be as great as available space will allow to provide a maximum amount of heat absorption by the gas. A shut-off valve, orifice or other restriction may be substituted for the first regulator in the series when the pressure on the transmission line at the peak load periods is uniform and of approximately the same value during each period. During the periods of light load freezing would seldom occur.



Tandem Regulators To Provide for Large Pressure Drop. Note Relief Valve on Riser

The practice of insulating regulators and inlet lines is only partly effective as insulation is only desirable at atmospheric temperatures below which trouble from freezing occurs. When the atmospheric temperature is above the trouble zone freezing is prevented by absorption of heat from the atmosphere by the regulator body and transferred by conduction into the gas and maintains the gas above the dew point. Insulation would interfere with the heat transfer from atmosphere to gas.

Operation and Repair

The greatest difficulty experienced in the operation of a line regulator is the result of foreign matter carried by the gas stream. This foreign matter may be roughly divided into two classes, dry solid particles and liquids. The dry solid particles are frequently and categorically called dust even though the source of the matter may be entirely foreign to that ordinarily creating dust and the particles may be much larger in size. The sources of this dust have been mentioned under the subject of house regulators. The effect of the foreign solid particles is practically confined to the valve and orifice where metal surfaces or valve discs may be cut by a direct scouring action or crushing and to imbedding in valve discs. In exceptional cases the solid matter may be much larger than the ordinary particles as old shirts, waste, pick handles, broken shovel handles, wood, small dead animals, etc., have lodged in line regulator valves and prevented the valve from closing. Such articles are the result of improper cleansing and blowing of new mains. Particles originating from the interior of pipes, manufacturing plants and natural wells should be studied and equipment installed to remove or prevent their occurrence at the source rather than at each individual regulator if the trouble is of a severity warranting added investment.

Water and Drip Oil

Liquids vary widely in their nature from light oils and water vapor to viscous gums and tars. Unless water and drip oil exist in excessive quantities their presence would not ordinarily interfere with the operation of a regulator. Large quantities would tend to saturate the diaphragms and the drip oil odor which is almost impossible to confine would make working conditions for inspectors and repairmen unpleasant if not nauseating. Drip oil contacting with the floor or walls of the regulator housing quickly penetrates masonry or wood and the resulting odor is difficult to eliminate so every precaution should be taken to avoid any spilling on to the floor or walls. The light oils will frequently seep through gland and flange packings, screw joints and diaphragms even though gas would not escape at the same locations. It is seldom possible to prevent such oil leakage but one or more drips installed ahead of the regulator will minimize the trouble. At least one of the drips should be immediately adjacent to the regulator and of a baffle type. Drips are not ordinarily placed inside the regulator housing but are buried close by. The installation of a drip ahead of each line regulator even on dry gas to act as a retainer for any type of foreign matter is good practice. No matter how careful construction crews may be foreign matter will occur from tapping, scaling, corrosion, blowing of services, etc., whose effect may not be noticeable until a year or two after the system has been operating. The frequency of pumping or blowing drips is entirely a local matter and must be determined by experience.

Tars and Gums

Tars and gums frequently affect operation by adhering to the surfaces of the valve disc or orifice seat resulting in uneven seating, preventing gas flow at low flows and acting as a retainer of solid particles. The regulator valve will often remain clean but gums will fill the diaphragm chamber underneath the diaphragm resulting in sluggish operation at first and finally may completely prevent the regulator from functioning. An effective and on manufactured gas a readily accessible solvent for cleaning gum from the interior of line regulators, is drip oil. Some means of forcibly spraying the drip oil onto parts covered with gum will assist in removal especially from the more inaccessible parts such as the orifice. Parts easily removed as the valves may be soaked and washed in the drip oil. It is preferable to change valve discs or diaphragms rather than attempt to remove gums. Valve discs or diaphragms which have become impregnated with drip oil should be removed and discarded instead of dryed, reoiled and reused. Removal of gums from the interior of a line regulator should be complete before replacing in service as the existence of only small particles appears to cause or assist in additional gum formation. Gums will often penetrate the best grades of diaphragm leather which does not necessarily indicate porosity of the leather to gas. This gum action was described and illustrated in the discussion of house governors.

Solid Foreign Matter

Trouble caused by either liquid or solid foreign matter results in characteristic indications on pressure recording charts located at or close by a regulator outlet. An inspector

soon becomes familiar with the pressure up to which a distribution system will build during off peak hours and the appearance of the pressure curve when the regulator is functioning properly. Foreign matter lodging on a valve is usually indicated by a gradual but even build up of the regulated pressure during the off peak hours beyond that at which the governor was set to lock up. The amount of the pressure increase above normal would be indicative of the quantity of gas passing through the line regulator with the valve closed.

The pressure increase is seldom sufficiently extensive to result in harm to any part of a distribution system and may be allowed to continue for several days during which interval, pressures will often return to normal due to the dislodgment of the foreign matter from the valve or the matter becoming imbedded in the valve disc sufficiently to allow a gas tight seat. Imbedding of foreign material in the valve disc will result in either a continued increase or decrease in the pressure build. Should the increase above normal continue reaching a greater value for each of three or four days the valve disc should be changed. If the increase above normal reaches a consistent value repeatedly and no changes in the balancing force can be detected it may indicate a scratch across the orifice seat or metallic valve. Changing the balancing force to compensate for pressure increases above normal is not advisable except as a temporary expedient which must be carefully watched to detect any tendency to return to normal pressure and a possible poor consumer service result during peak demands.

Viscous Gums

Viscous gums sometimes cause a regulator valve to stick closed resulting in sudden increases of pressure on the regulated side when the valve suddenly opened after the adhesive power of the gum was exceeded by the weight of the balancing force. As the gums increase in quantity and partly fill the diaphragm chamber the pressure increase will be rapid but not instantaneous and will occur more frequently until the quantity of gum finally entirely prevents the regulator from functioning. The initial sudden pressure increases will not interfere with consumer service but repair and cleaning should immediately follow the first indications noted on recording charts. No chance should be taken that such trouble will rectify itself even though the sudden pressure increases occur in connection with pressures in excess of the original lock up.

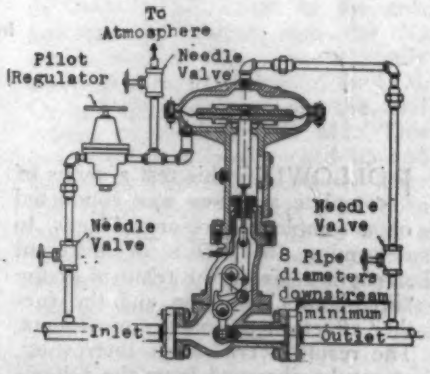
Regulator Pumping

The hunting or pumping of a regulator may be defined as vibration of the valve resulting in the outlet pressure chart having the appearance of saw teeth. The period of the pulsation should be at least thirty or more per minute to be designated as hunting as there are other types of repeated changes in the outlet pressure which could not be termed vibratory in nature. Hunting often results from an attempt to secure too sensitive a regulator without the use of pilot controls. An unnecessarily large diaphragm may be the cause of the sensitivity. If the size of the diaphragm can not be readily changed the effective area of the diaphragm may be decreased by inserting an annular ring between the flanges the inside diameter of this ring would decrease the effective area of the diaphragm.

Excessive opening of the needle valve may also cause hunting the remedy being to decrease the needle valve opening so as to dampen changes in the controlled pressure before such changes reach the diaphragm. A recording gauge would have to be comparatively close to a regulator to be affected by hunting unless such hunting was excessive when its effect would be transmitted to house governors and may also cause them to hunt. The static line inlet may be located too close to the regulator valves therefore causing the diaphragm to be oversensitive to pressure changes which may occur frequently in the valve chamber and not be entirely throttled at the regulator outlet. The frequent pressure changes are decreased by improvement of the flow lines in the regulator valve chamber but such improvement can only be accomplished by alteration of a design. Hunting may be prevented by extending the static line beyond the area of pressure fluctuation. Too large an opening around the main valve stem between the valve and the diaphragm chambers may also be the cause of hunting by conducting the pressure fluctuations in the valve chamber to the diaphragm similarly to an excessive static line needle valve opening. Stuffing boxes between valve and diaphragm chambers are to be avoided when possible but a leather apron or diaphragm tied to the valve stem and fastened to the valve chamber with sufficient excess to allow freedom of stem movement is often effective in preventing trouble from that source.

Sluggish Operation

When a regulator operates sluggishly and the needle valve has been found to be properly opened, the static line should be investigated to ascertain whether it has become plugged or whether with increases in load the size of a long static line may be adequate. Inspectors and repairmen must recognize the fact that while not continuous there may be a flow of gas in direction through the static pipe either to relieve the pressure underneath the diaphragm as it travels downward or to prevent a vacuum forming under the diaphragm during its upward motion especially true when there is a complete sealing of the diaphragm from the valve chamber.



Hunting Precluded By Comparatively Large Valve Opening Required for Small Initial Flow In This Unbalanced Valve. Flow Lines Much Improved over Flat Type Valves.

Unbalanced Pressure

Another cause of hunting is an unbalanced pressure condition on the two valves comprising a balanced valve design. The design of certain valves makes it necessary to have one larger in diameter than the other to provide removability. In other regulators the flow lines may be such that at certain rates of flow one valve will pass considerably more than the other. Both of these conditions would cause a higher pressure on one valve than the other which may result in a slight vibratory movement of the valves in the attempt to stabilize pressures. Oversize valves may cause hunting particularly in the lower ranges of flow as a small movement of the valve would result in comparatively large changes in volume. The actual cause in these cases of hunting can be eliminated only by replacing the regulator with another not having the inherent defects. The effect

(*Continued on page 47*)

Gas Analysis: The Application Of Exact Analysis To Industrial Problems

By

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Indiana Consumers Gas & By-Products Company, Terre Haute, Indiana

PART II

FOLLOWING this test a series of complete analyses was conducted on a sample of "reformed" gas, to determine the effect of different strength acids on the removal of the "illuminants" fraction and the further effect on the other constituents. The results were rather interesting, as can be observed from the following:

	I. REGULAR ANALYSIS	II.	III. MODIFIED ANALYSIS	IV.
	15% Fuming H_2SO_4	15% Fuming H_2SO_4	50%-15% Fuming H_2SO_4 50%-95% H_2SO_4	95% H_2SO_4
	3 Passes	26 Passes	24 Passes	20 Passes
CO_2	1.28	1.11	1.29	1.09
O_2	0.07	0.13	0.02	0.16
III.	0.62	1.44	0.38	0.86
H_2	56.09	55.94	55.78	55.41
CH_4	13.02	12.03	10.98	11.20
CO	25.49	24.66	25.62	25.40
N_2	3.43	4.69	5.93	5.88
	100.00	100.00	100.00	100.00
BTU				
Determined	402	402	402	402
Calculated	401	403	376	385
SP. GR.				
Calculated	0.419	0.426	0.430	0.433

The sample was stored over acidulated water which will account for the discrepancies in the CO_2 and O_2 fractions between the analyses. This series does illustrate quite readily that the removal of the illuminants fraction is not a direct function of the strength of the acid as note the 0.86% removal in IV and only 0.38 in III. Of greater importance than this though is the difference in the percentages of the other constituents particularly that of the N_2 content which as noted previously is measured direct at the end of the analysis. This increase in N_2 has been observed invariably when a sample of gas was repeatedly scrubbed with acid. One explanation for this peculiarity may lie in the fact that the acids used were in equilibrium with air and that part of the dissolved N_2 in the acid was taken up by the gas when passed thru the acid repeatedly. This point, however, is being investigated at the present time.

Presented before the American Chemical Society, Cleveland, Ohio, September 10-15, 1934.

A Study of Natural Gas

A systematic study was then begun on a sample of natural gas (free from sulfur compounds) and stored in a steel cylinder under a pressure of 120 lbs. Two complete duplicate analyses were conducted on this sample as a check against any change in composition of the gas during storage. Several samples were run employing unused 15% fuming sulfuric acid to check the effect of the repeated acid scrubbings previously noted and again showing negative quantities for ethane and an increase in N_2, while others after scrubbing with the acid, and the removal of the acid fumes were burned in the combustion pipet with O_2. Following the combustion the gas was checked for the presence of SO_3 and SO_2 in a closed pipet so arranged to permit the gases to contact test papers of litmus, potassium iodate starch and one through a solution of acidified $BaCl_2$. The litmus paper only was reacted upon.

A sample of "reformed" gas was then made for plant operation and the acid used for the above tests was employed for the determination of the illuminants fraction in this sample. The reported result of 0.19% for this fraction was abnormally low in comparison to our previous analyses and suggested a possibility for the hitherto unexplained discrepancies in this determination.

Tank Oxygen

A sample of tank oxygen, analysis 99.47% O_2, 0.53% inerts, was taken into the burette after the N_2 in the entire apparatus had been replaced with the same O_2. This sample was passed three times through the fuming sulfuric acid, followed by three passages through the KOH for the removal of the residual acid fumes and then burned as in a regular analysis, with these results:

SAMPLE = 90.38 ML

Removal on 3 passes thru 15% fuming H_2SO_4.....	= 0.56 ML
Removal on 3 additional passes thru KOH.....	= 0.00 ML
Contraction on combustion..	= 3.23 ML
Removal thru KOH after combustion	= 1.51 ML

The oxygen had previously been checked for combustible components and none were found so that the rather obvious conclusion presents itself that the O_2 removed from the acid part of the CH_4 and C_2H_6 which had been absorbed from the natural gas by repeated passage through it, and were, of course, burned when the gas was subjected to a combustion.

In spite of the fact that the foregoing tests offer a reasonable explanation for the discrepancies observed in the determination of the "illuminants" fraction, a satisfactory method for avoiding the error has not been devised, but the present practice is to make two passages through a 15% fuming sulfuric acid solution and to use acid which is in equilibrium with the individual gases.

Computation of An Analysis

One of the serious drawbacks to conducting an exact gas analysis has always been the rather arduous computations at the end of the analysis. To overcome this difficulty a method was developed to translate the results obtained from an analysis to the final report in a minimum of time and with no sacrifice in accuracy.

To review briefly the corrections which are necessary when an "exact" gas analysis is desired:

1. Correction for the inert content of the O_2 used for combustion, which, if not accounted for would introduce an error in the reported N_2 content of the gas, as well as in the actual amount of O_2 used for combustion.

2. Correction for the residual gas remaining in the manifold and which is not burned. This would further increase the reported N_2 content of the gas and at the same time cause a very appreciable error in the combustible components.

3. Correction for deviation from the ideality of the CO_2 produced on combustion which would affect the total contraction (TC) as well as the CO_2 produced.

These corrections, which amount to a considerable error if neglected, are simplified in the manner described below:

Corrections Simplified

In the first instance, the inert content of the O_2 used for combustion is determined for each new tank of O_2 when received and from this analysis a table is prepared showing the equivalent inert content for each ML of O_2 introduced into the burette. The application of this will be illustrated in a sample calculation.

The correction for the residual unburned gas in the manifold is also corrected for by means of tables, the calculation of which is shown also in the sample calculation to follow.

The third correction, that of deviation from ideality of the CO_2 produced on combustion is automatically corrected for by the use of the following equations for CH_4 and C_2H_6 obtained from Shepherd employing TC, CO_2 and O_2 instead of just the conventional TC and CO_2:

$CH_4 = \frac{1}{3}\,[7(TC + CO_2) - 9\,O_2]$

$C_2H_6 = \frac{1}{3}\,[6\,O_2 - 4(TC + CO_2)]$

and when employing the equations of TC and CO_2 which are:

$CH_4 = \frac{1}{3}\,(4\,TC - 5\,CO_2)$

$C_2H_6 = \frac{1}{3}\,(4\,CO_2 - 2\,TC)$

the total percentage of the analysis was invariably 101 to 104 and not correcting for the deviation from ideality of the CO_2 produced on combustion.

See sample calculation of a complete analysis:

Now if the gas introduced into the burette as the original volume of 81.88 ML had been entirely burned the reduction of the volumes obtained for each constituent to the percentage basis would be simply the multiplication of each value by the factor $\frac{100}{81.88}$ or $\frac{1.2213}{}$ (f_1). Part of the gas, however, is diluted with the N_2 which was in the train originally and held in the capillaries of the CO_2, O_2 and Illuminants pipets, the total volume of which is 0.877 ML. This gas could have been picked up and burned in a second combustion after the main body of gas had been burned, but to do so would take a considerably longer time and as Shepherd has shown can be avoided and accounted for in the calculations.

SAMPLE CALCULATION

Sample = ...	81.88 ML
	81.10
CO_2	0.78
	81.10
	81.02
O_2	0.08
	81.02
	80.28
Ill.	0.74
After absorption of CO_2, O_2, Ill.	80.28
O_2 taken into Burette.....	90.24
Total volume before combustion.	170.52
Volume after combustion.....	54.88
Contraction on combustion (TC).	115.64
	54.88
After CO_2 Removal.....	11.34
CO_2	43.54
After CO_2 Removal.....	11.34
Apparent Residue.....	5.32
Excess O_2.....	6.02

Volumes	
CO_2 = ...	0.78
O_2 = ...	0.08
Ill. = ...	0.74
H_2 = ...	31.90
CH_4 = ...	30.68
CO = ...	12.86
N_2 = ...	4.84
Total = ...	81.88

$H_2 = TC - O_2 = 115.64 - 83.74$ ..... = 31.90

$CH_4 = O_2 - \frac{1}{3}\,(CO_2 + TC) = 83.74 - \frac{1}{3}\,(43.54 + 115.64)$ ..... = 30.68

$CO = \frac{1}{3}\,(4\,CO_2 + TC - 3\,O_2) = \frac{1}{3}\,(4 \times 43.54 + 115.64 - 3 \times 83.74)$ ..... = 12.86

SUMMARY OF COMBUSTION

Oxygen (O_2)		Contraction on Combustion	CO_2 Produced by Combustion	N_2 (Residue)
O_2 taken into Burette	= 90.24	115.64	43.54	
Correction for Inerts	= —0.48			
Actual O_2 taken.....	= 89.76			Apparent Residue = 5.32
Excess O_2.....	= —6.02			Inerts in O_2 = —.48
O_2 Consumed	= 83.74			N_2 Residue = 4.84

This latter method is far simpler and really more accurate for our experience in attempting to burn this small fraction results in a very appreciable oxidation of the N_2.

Correction for Volume

The calculation of the correction for this volume is as follows: The volume of N_2 in the manifold with which the gas is diluted before combustion was found to be 1.436 ML and the volume of the gas trapped below the stop-cocks of the manifold in the CO_2, O_2 and Illuminants pipets was 0.877 ML. The volume of the gas after the removal of the CO_2, O_2 and Illuminants was = 80.28, then the volume of N_2 in the 0.877 ML is:

$$0.877 \times \frac{1.436}{1.436 + 80.28} = \frac{0.0154 \text{ ML}}{} N_2$$

and the actual gas then in this volume is:

0.877 ML
—0.015 ML

0.862 ML Gas unburned

so that the gas actually burned is:

Gas before combustion = 80.28 ML
Unburned portion remaining in pipets = – 0.86 ML

Gas actually burned = 79.42 ML

This volume of 79.42 is now used for computing the H_2, CH_4 and CO.

$$\frac{80.28}{79.42} = \frac{81.88}{\times} \text{ or } \times = 81.003$$

which is the fraction of the original sample which should be used for computing the combustible components, and the reciprocal is calculated to obtain a multiplying factor $\frac{1}{81.003}$

$$= \frac{1.2345}{} = f_2$$

Now since the previous calculation admits the presence of unburned gas in the residue as determined this must be deducted from the residue to obtain the true volume of N_2 from the original sample of 81.88 ML.

It was shown that there remained in the capillaries 0.862 ML of unburned gas and using the volumes computed for H_2, CH_4 and CO.

$$\frac{31.90 + 30.68 + 12.86}{79.42} \times 0.862 =$$

0.818 ML

which is the volume of H_2, CH_4 not burned and is contained in the volume of 4.84 ML measured as N_2.

A summary of the factors to be used in computing the final analysis are:

1. $f_1 = 1.2213$ for reducing the volumes of CO_2, O_2 and Ill. to the percent basis.
2. $f_2 = 1.2345$ for reducing the volumes of H_2, CH_4 and CO to the percent basis.
3. The deduction of 0.82 ML from the apparent residue of 4.84 followed by the multiplication of f_1 (1.2213).

The final analysis can now be calculated.

	ML		Factor	%
CO_2	0.78		× f_1 (1.2213) =	0.95
O_2	0.08		× f_1 (1.2213) =	0.10
Ill.	0.74		× f_1 (1.2213) =	0.90
H_2	31.90		× f_2 (1.2345) =	39.38
CH_4	30.68		× f_2 (1.2345) =	37.87
CO	12.86		× f_2 (1.2345) =	15.88
N_2	4.84	(4.84—0.82)	× f_1 (1.2213) =	4.91
Total	81.88			99.99

The essential features of this method of computing the analysis are given by Shepherd in Research Paper No. 266.

New Requirements For A New Type of Appliance

A.G.A. Committee and Research Activities Directed Toward Gas Hair Dryers

HARRY W. SMITH, Jr.

Publications Department, A.G.A. Testing Laboratories

THE significance of the well known slogan "If It's Done With Heat, You Can Do It Better With Gas" has been demonstrated again by the general acceptance during the past two years of the newly developed barber's and beautician's aid—the gas operated hair dryer. Frequent reports have been received recently describing successes various gas utilities have enjoyed in annexing this new variety of commercial load.

Hair drying by gas has presented such attractive possibilities for load building and the cultivation of favorable public relations that numerous gas-fired hair drying appliances have been developed and placed on the market in a short time. Apparently these appliances have been well received, for barbers, beauty experts, and executives of the gas industry have all upon occasion, commented on the greater economy, speed of operation, silence, and efficiency attained with hair drying equipment operated by gas rather than by other means.

A new market for gas and gas-consuming equipment has been opened by aggressive interests through pioneering in the application of gas

Rating a Multiple-Helmet Gas Hair Dryer At the A. G. A. Testing Laboratories During the Investigation of Such Equipment

to beauty culture. If the gas industry is to carry on with this movement and reap maximum benefit from its efforts, equipment that is reliable beyond doubt will, of course, be required. If hair dryers employing gas as a fuel are to be sold and used, there will be many who will demand the A.G.A. Testing Laboratories' Seal of Approval on each unit, for many already consider the Laboratories' certification as an essential attribute for gas-burning equipment.

In fact, as a result of demands from the industry a number of hair dryers have already been tested by the Association's Laboratories in accordance with the American Standard Approval Requirements for Gas Space Heaters and for Unit Heaters and the Laboratories' approval granted to some half dozen such units. This procedure has been followed in the absence of specific requirements for hair dryers. However, new types of gas operated hair dryers are being submitted regularly and the need for separate approval standards for such equipment is becoming increasingly apparent. Consequently, the American Gas Association Approval Requirements Committee (American Standards Association Sectional Committee, Project Z21) pursuant to discussion at its Cleveland meeting, April 19 and 20, authorized the formation of a subcommittee to formulate approval standards for hair dryers and instructed the Laboratories to conduct appropriate research for the guidance of that body in preparing adequate and sound specifications.

Such a subcommittee has now been formed. Its qualifications for undertaking the assigned task are obvious from its roster:

1. C. C Krausse, Assistant Manager, Fuel Sales, Consolidated Gas, Electric Light & Power Co. of Baltimore, Baltimore, Md.
2. Walter M. Berry, Consulting Gas Engineer, Los Angeles, Calif.
3. J. R. Denise, Utilization Department, Consolidated Gas Company of New York, New York, N. Y.
4. J. R. Emmert, Chief Engineer, Emil J. Paider Company, Chicago, Ill.
5. C. G. Gross, Chief Engineer, Halliwell, Inc., New York, N. Y.
6. A. J. Hartfield, President, Pacific Gas Radiator Co., Huntington Park, Calif.
7. Hugo Johnson, Ass't. Engineer Gas Distribution, Los Angeles Gas & Electric Corporation, Los Angeles, Calif.
8. Harry E. Kerr, President, The Barber Gas Burner Company, Cleveland, Ohio.
9. A. B. Lauderbaugh, Manufacturers Light & Heat Company, Pittsburgh, Pa.
10. N. J. Reiff, Appliance Laboratory, United Gas Improvement Company, Philadelphia, Pa.

This body will meet in the near future to consider the results of the Laboratories' investigation and complete tentative requirements. The members have already been supplied with a report from the Laboratories covering the research recently completed, and presenting a comprehensive set of suggested requirements based thereon.

During this Laboratories' research extensive data has been collected on several widely divergent types of gas hair dryers. In addition, recourse has been made to the test data amassed on those units which have already been tested for approval by the Cleveland and Pacific Coast Laboratories. Information of wide range has thereby been obtained regarding all the details of design, construction and performance of many different units now being manufactured.

The phrasing of satisfactory requirements will not be, in this instance, an easy matter, for the newness of this application of gas and the technical ingenuity that has been unleased upon design problems has caused wide variations in the constructional and functional principles of different units.

Quite obviously, requirements covering distribution of warm air flow to the various outlets of multiple-helmet dryers will be found necessary. The distribution of warm air temperatures at the various arms and helmets, as well as the temperature control features of the unit, will also require governing. It seems that the appliance efficiency (tentatively proposed to exceed 75 per cent) will be judged from tests of flue loss with account made for heat losses from duct and appliance body surfaces. Actual drying air temperatures will, of course, be limited appropriately, as will appliance surface temperatures. Needless to say, the customary variety of minimum standards for combustion, fire hazard, durability, and convenience features will probably be approved. All in all, sound requirements along the usual lines but specifically adapted to gas hair dryer design and operation will be carefully and authoritatively developed.

Again the procedures of the American Gas Association have been applied to a new field to serve and safeguard the best interests of the gas industry and the gas-consuming public.

Program Gas and Fuel Chemistry Meeting

Following is program of Gas and Fuel Chemistry Division, American Chemical Society meeting to be held at St. Francis Hotel, San Francisco, Calif., Aug. 19 to 23.

Tuesday Morning

Joint Symposium on The Utilization of Natural Gas Hydrocarbons with the Divisions of Industrial and Engineering Chemistry and Petroleum Chemistry.

Wednesday Morning and Afternoon

9:00—Business Meeting.

9:15—1. Claude C. Brown. Natural Gas in California in the Year 1934.

9:45—2. S. Clark Jacobsen and George W. Carter. The Practical Solution to the Smoke Nuisance in Salt Lake Valley.

10:15—3. Frank W. Douglas. Low-Temperature Carbonization of Coal of the Pikes Peak Region. Evolution of Gases.

10:45—4. James E. Louttit. Low-Temperature Thermal-Chemical Treatment of Coal by the Records-Louttit Process.

11:15—5. C. R. Holmes and J. D. Davis. Ignition Temperature of Coke and Air Required to Support Combustion.

2:00—6. D. A. Reynolds and J. D. Davis. The Reactivity of Coke.

2:30—7. C. C. Furnas. A New Method for the Definite Determination of the Reactivity of Solid Carbon.

3:00—8. J. Elton Lodewick. Wood Fuels in the Pacific Northwset.

3:30—Business Meeting.

The New Law Of Gas Rates

By Leo T. Parker

Attorney at Law
Cincinnati, Ohio

QUITE recently the higher Courts in different localities have rendered several unusually important decisions involving gas rates, and service. In the majority of these decisions the Courts have considered relevant circumstances, with respect to present day valuations and other modern conditions, which results in these late cases and decisions being exceptionally interesting and informative.

For example, the recent Courts have held that the basis of calculation for real property valuation is the *fair* value of the property. In other words, that what the seller of gas is entitled to demand, in order that it may have "just compensation," is "a fair return upon the reasonable value of the property."

In determining that basis, the criteria at hand for ascertaining market value, or what is called exchange value, are not commonly available. The property is not ordinarily the subject of barter and sale. Moreover, earnings produced by rates charged for gas do not afford a standard for decision. The value of the property, or rate base, must be determined under these inescapable limitations, since the Courts have refused to be bound by any artificial rule or formula which present unusual or changed conditions might upset.

Therefore, although a Public Service Commission must fix a fair value of public utility property for rate-making purposes approximately *as of date of filing of its order,* yet since rates affect the future, at least for a time, due consideration must also be given to the past history, as well as to the immediate present, in order that a reasonable rate may be established. And for these reasons the Courts are likely to establish a valuation considerably higher than the present cost of reproduction.

In Chambersburg Gas Co. V. Public Service Commission, 176 Atl. 794, reported March 2, 1935, it was shown that a Public Utilities Commission fixed the value of a gas company's property for rate making purposes, as follows:

Physical Property	$391,825
Overhead Costs of Organization and Construction	60,212
Cost of Financing	13,561
Reproduction Cost New, as of July 1, 1929	$465,598
Depreciation to same date, 14% plus	65,000
Value, July 1, 1929	$400,598
Deduction for change of price between July 1, 1929, and date of filing report, November 15, 1932	20,598
Fair Value	$380,000

Neither of the parties, in endeavoring to fix the fair value of the property, offered evidence of original or historic cost, and such cost could therefore not be determined. They depended, with slight exceptions, upon estimates of the cost of reproduction of new property less accrued depreciation. And, as will be noted, the Commission reduced the 1929 valuation of $400,598 to $380,000, or approximately 5% less for 1932.

The Gas Company appealed to the higher Court on the contention that 5% reduction of the valuation from 1929 to 1932 was not equal to the actual depreciation, particularly when the 1932 low cost of reproduction is considered.

However, it is interesting to know that the higher Court sustained the Commission's valuation, and said:

"As the rates affect the future at least for a time, consideration must be given to other elements, including past history and trends, as well as to the immediate present in order that a reasonable rate may be established on a plant reasonably necessary for the services rendered . . . . It is, of course, difficult to establish the degree of accuracy of this trended estimate applied to a specific property. However, it is a matter of common knowledge of which the commission takes notice that there was a general drop in price levels in this period and that the downward trend has continued until the present time . . . . The commission is of the opinion that this general change in prices, a matter known to all our people, should be taken into consideration in establishing the value of the property. This does not mean, however, that it must be taken as an exact indicator of present value. We consequently conclude that the present fair value of respondent's property for rate making purposes is $380,000. This judgment figure is equivalent in effect to averaging prices for the high price period in 1929 with the low prices of the present time, but still giving more weight to the higher prices which persisted over a longer number of years than to the present low prices."

Rates Based Upon Stock Valuation

As a general rule values determined in former years will not aid in determining present values. Such questions as capitalization and the amount and kind of securities and the market value of the same can have in any event only remote evidential value upon which to base gas rates.

In many instances, capitalization bears no particular relation to invested or present value, and the market price of securities depends upon the rates charged for service. If rates are lowered by the Public Utilities Commission, the market value of securities will fall. If the rates are raised, within reasonable limits, the value of securities will rise. Therefore, it is now usually held by the majority of Courts that stock valuations or the price paid for stock is not a legal basis for determining present value for rate making purposes.

For example, in the recent case of Vincennes V. Public Service Commission, 32 F. (2d) 14, it was disclosed that a Public Utility petitioned the Public

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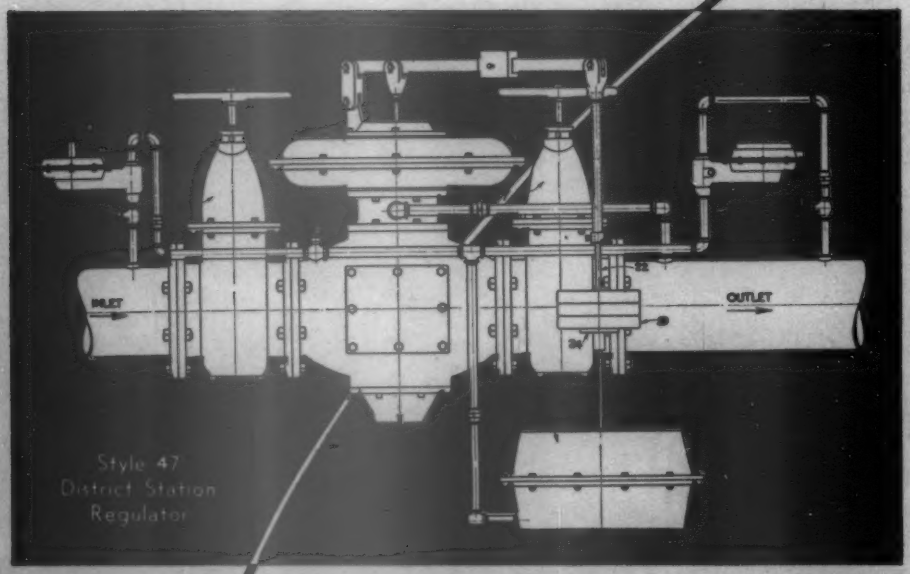

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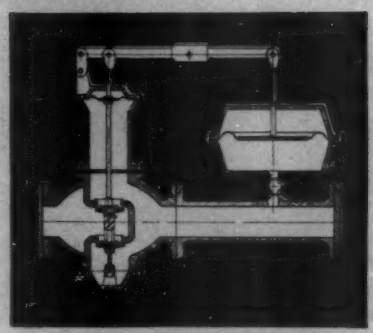
- ☐ **Auxiliary control gives more sensitive regulation and positive shut-off with operating power from high pressure side.**
- ☐ **Each regulator tested under actual service conditions before shipment and Factory Test Record furnished, together with complete instructions for installing and operating.**
- ☐ **Quality materials, skilled workmanship, and rigid inspection assure close control, low maintenance cost, and long life for each unit.**



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Service Commission for authority to institute a schedule of increased rates, alleging that the fair value of its property was $1,500,000. The Commission refused to approve the valuation but ordered a schedule of rates based upon a rate base valuation of $725,000.

The Public Utility company filed suit alleging that the fair value of its property is not less than $1,500,000 as this is the fair amount paid by investors for its stock. The company contended that for its rates to be fixed upon a valuation of $725,000 amounted to the taking of its property without due process of law, and in violation to the United States Constitution.

The Public Service Commission contended that the price paid for stock of the company at private sale furnished no adequate test of the value of the property, since the stock is quoted upon no exchange. With respect to this situation the Court said:

"If the purchaser paid too much for his stock, the public should not as a result be imposed upon by rates to fix a reasonable return upon such purchase price. If the purchaser paid too little, he is entitled to the benefit of his bargain. To determine value from the purchase price of stock at private sale is, as indicated above, to reason in a circle, for if rates charged be unreasonably low, the value of the property upon that basis is depressed; if unusually high, it is inflated. The test is always the present fair value of the property."

Results of Furnishing Free Gas

It has been held that the furnishing of gas without charge to certain inhabitants of a city is an unlawful burden on the municipality, and other consumers, and that the cost of supplying this gas must be taken into account in fixing rates. In other words, the effect of supplying free gas is to shift the burden of expenses from the industrial and domestic users of gas to the taxpayers, or it necessitates the payment by gas users of higher rates than they would have to pay were the cost of furnishing gas borne by all who use it. This rule of the law is applicable with respect to any and all contracts with municipalities or gas corporations, or by the terms of which for instance a gas company agrees to furnish gas free to a municipality for any purpose.

For example, in Alexandria V. City Council of Alexandria, 177 S. E. 481, it was disclosed that a corporation contracted many years ago to furnish service free of charge to a city for certain purposes. Recently the corporation filed a petition with the Public Utilities Commission asking that it be permitted to increase its rates.

The counsel for the corporation contended that it should be permitted to include the cost of furnishing free service to the city, when arriving at its cost of operation, upon which to base reasonable rates in order to assure a reasonable return on its investment. In upholding this contention the Court said:

"The provision of its charter that it shall furnish 'free of any fee, charge or demand whatsoever' operates to prevent the company from making a charge therefor to the city . . . . but it does not operate to prevent the company from including the cost of such service, and a reasonable return on the property used and useful in furnishing such service, in the amount to be raised by rates charged its customers."

Validity of City Ordinance

Generally speaking, the power to regulate rates to be charged by gas companies is a power residing primarily in the state, and no city or subdivision of the state can exercise such power unless it is authorized to do so by the state laws. Therefore if the State Legislature has not conferred that power upon cities of a special class, then an ordinance regulating the rates to be charged for gas is invalid.

Another important point of the law is that although a gas company's charter gives it a right to charge present prices being paid by consumers for gas, this does not prevent a city council from enforcing reasonable rate laws, if such laws are authorized by the State Statutes. So held the United States Court in the leading case of Kentucky V. Maysville, 36 F. (2d) 816.

In this case it was disclosed that a gas company was authorized to supply gas by a state law. This law provides that the council of each city may fix and regulate the prices to private consumers and customers.

The gas company's charter authorized the company to furnish gas for all purposes and "to furnish gas and gas light to the city by contract with them."

Under this charter the company laid its gas lines and commenced the conduct of its business in the city.

In 1929 the council passed an ordinance making it unlawful for the gas company to charge for gas more than 40 cents per 1,000 cubic feet. The gas company filed suit to prevent enforcement of the ordinance on the grounds that the provisions in the charter, which gave the company the right to supply gas at any price contracted by users, prevented the city from limiting the rates charged for gas, although the above mentioned state law delegated that power.

However, the Court held the city within its rights to enact a reasonable ordinance restricting the gas rates. This Court said:

"The power to regulate rates of public utilities is inherent in every sovereignty. It is legislative in character and is a part of the police power. The state may, within limits, contract with a utility as to the rates to be charged, yet it may well be doubted if, under the modern rule, it can irrevocably surrender all regulatory power. Certainly no such surrender is to be presumed. On the contrary, every presumption is against any such surrender. A charter provision claimed to work such a surrender must not be so construed if any other construction is reasonably possible . . . . "

Operating Expenses Erroneously Excluded

It has been contended by many municipal and gas company officials that once the Public Utilities Commission has established fair and reasonable rates to be charged consumers of gas, the seller of the gas cannot open the case and demand immediate reconsideration on the grounds that certain items of its operating expenses had been erroneously estimated or excluded. However, this is not true, according to the most recent higher Court decision.

For example, in West Ohio Gas Co. V. Public Utilities Commission of Ohio, 196 N. E. 674, reported July 17, 1935, it was disclosed that the municipal authorities of the city of Lima had passed an ordinance effective April 19, 1928, prescribing the maximum price to be charged for gas to consumers within the city during a period of five years. The rates were to be as follows:

For the first 1,000 cubic feet of gas..$.90 per month
For the next 3,000 cubic feet per mo..80 per M. C. F..
For the next 6,000 cubic feet .....75 per M. C. F.
And for all over 10,000 per mo.....65 per M. C. F.

This was a marked reduction under the rates previously charged, which were:

$1.25 for the first 400 cubic feet
1.05 for the next 9,600 cubic feet
1.00 for the next 15,000 cubic feet and
.75 per M. C. F. for all over 25,000.

(Continued on page 41)

Domestic Gas Utilization

Water Heating Division

Gas Consumption for Water Heating

By

Charles W. Merriam, Jr.

Div. Commercial Manager, Consolidated Electric and Gas Co., Roanoke, Va.

THE determination of the probable average monthly operating cost in a given home is the objective of most water heating calculations and incidentally, the "bugaboo" of most gasmen. That retail gas salesmen generally treat this phase of the problem "gingerly" is due, in most instances, to a lack of comprehension of a sound and workable method of approach and analysis of the existing and probable facts obtaining in the home in question. In the preceding article we dealt with 1. hot water quantity demands; 2. "hot" and "cold" faucet temperatures. The object of this article is to ascertain the gas consumption of the water-heating unit itself when the monthly quantity of hot water is assumed as being known. In the next article we will take up that additional gas which is required to offset the heat losses in the hot water piping system from the heater unit to the faucet, which treatment will round out the process of "buttoning-up" the operating cost element. Here again the job within reasonable limits of accuracy is, with the aid of a little concentration, an easy one.

It is logical here to start with the answer, so to speak, and then analyze the more important factors influencing the same.*

The chart below shows the variation in the number of cu. ft. of 522 Btu. gas used per gal. of hot water delivered through an approximate 66° F. temperature rise, cu. ft. per gal. being plotted here against variable hot water consumption. Each small dot on the chart is the result of an actual field test in a home extending over an average period of 95 days. The tests were conducted on domestic systems (including the hot water piping) of a conventional design and make of a commonly accepted automatic storage type (slow and medium recovery capacity) currently on the market. Although the installations were in no wise hand picked, the results probably are better than the normal due to an uncommonly sound technique in the method of installation and servicing.

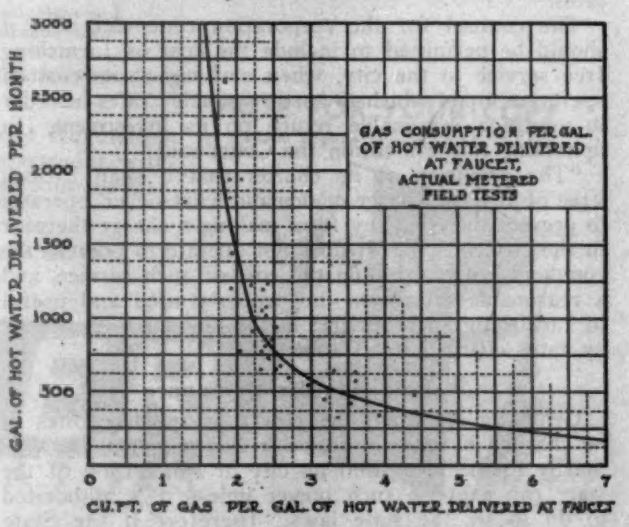
It is of supreme significance to observe the trend of the foregoing curve, in which the gas consumption per gal. of hot water delivered at the faucet varies from 5.70 cu. ft. at 250 gal. usage per mo. to 1.75 cu. ft. at 2,170 gal. per mo. This remarkable decrease in gas required per gal. delivered is attributable to the decrease in standby losses of the heater in relation to the total heat input as the hot water use increases. The engineers would doubtless become excruciatingly technical by stating that in this chart the curve approaches two infinities; namely, at no water withdrawal the gas per gal. would be at a maximum (which in reality is the standby loss when only a "readiness-to-serve" is accomplished) whereas the gas per gal. would approach as a minimum the thermal operating efficiency of the heater at full load factor.

A Concrete Example

Let us work out a case example based upon the data established in this curve in which the average consumer is assumed, for purposes of illustration, to require 44.1 gal. per day, or 1,323 gal. of hot water per mo., at the faucet. From the curve, at 1,323 gal. per mo., the gas consumption is about 2.05 cu. ft. per gal. which on a monthly basis is $2.05 \times 1{,}323 = 2{,}712$ cu. ft.

Carrying this example one step further to inquire into what is the over-all service thermal efficiency of the entire water heating system (8.33 Btu. raises 1 gal. through 1°F.)

$1{,}323 \times 8.33 \times 66 = 727{,}650$ Btu. or the net total heat absorbed by the water.

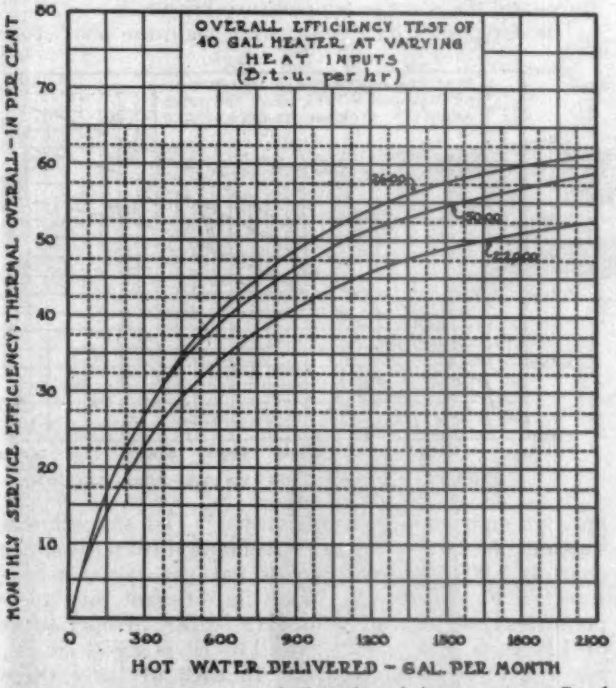


In the March, 1935, issue of the American Gas Journal "Domestic Automatic Water Heater Sales" by the author contains among other things an analysis of the causes and magnitude of the various heat losses in an average domestic automatic storage water heating system, as commonly encountered. In this reference will be found a discussion of the probable economic limits of efficiencies which are possible of attainment.

1,712 × 522 = 1,415,664 Btu. or the total heat input per mo.

Therefore 727,650 ÷ 1,415,664 = 51.4% or the over-all monthly system service efficiency.

Note that the above is an actual field test efficiency of the entire water heating system, including the auto-



matic storage heater and also the piping system. Study of the foregoing curve makes obvious the fact that the over-all service efficiency increases with an increased monthly water consumption until a maximum point of thermal efficiency is reached where the water withdrawal just equals the recovery capacity of the heater. This point of maximum over-all thermal efficiency is, of course, other things being equal, the operating efficiency when the main burner is on all of the time which is obviously a theoretical condition not often encountered in practice. If the storage capacity was sufficient to render adequate service, the maximum efficiency then is obtainable when the burner is operating continuously with a Btu. input just sufficient to heat the total water required from the heater in a mo.* Under this Utopian condition there would be no standby losses, the thermal efficiency of the heater with the burner in operation becoming the final over-all service efficiency. That is the maximum obtainable efficiency—or the greatest possible return in hot water received per dollar expended on the gas bill. The nearer the approach to this ideal condition the lower the gas consumption per gal. and hence the greater the customer satisfaction.

Apart from the total monthly hot water withdrawals from any given heater what else conditions gas consumption per gal. purely from a thermal efficiency standpoint (ratio of heat used to heat applied) and hence the gas bill? There are two major considerations:

1. Rate of heat input
2. Storage temperature

**Attacks are being made upon this problem of flue losses during standby periods by certain manufacturers through the medium of a damper mechanism actuated by fluctuation of the gas pressure in the main burner. When the main gas flow is off the damper is designed to assume a closed position thereby shutting off the passage of heat-absorbing drafts with a consequent retention of heat within the heater for useful purposes.*

Without any more than the necessary mathematical gyrations we will delve into the extent of the effects of these two variables.

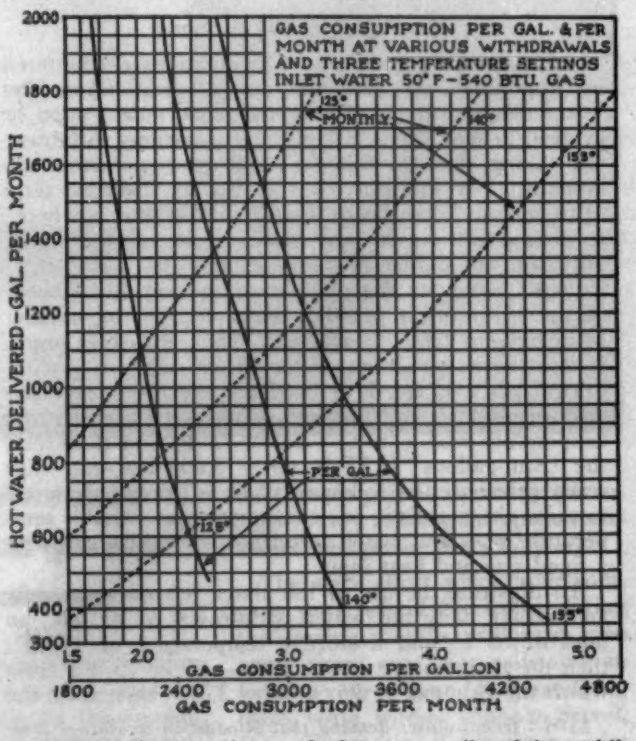
Relation of Efficiencies

To establish the relation of efficiencies existing between three different Btu. per hr. inputs (proper baffling of flue was undertaken to permit comparable "all on" efficiencies) the following is shown from actual test data plotted against variable hot water (storage temperature 155°F.) deliveries:

The chart indicates a trend similar to the preceding chart, namely, that as water withdrawals decrease the standby losses become a greater proportion of the heat balance thereby causing the efficiency to diminish to zero at the point of zero water withdrawal.

This last chart also indicates that in the range of normal hot water withdrawals in the domestic field the lower Btu. results in a substantially greater efficiency. Compare for instance at 1,200 gal. the efficiencies of the 2,600 and the 22,000 Btu. inputs which are, respectively, 45.6% and 54.1% from which it appears that the lower input is 18.6% more efficient for exactly the same amount of "useful work," i.e., the same withdrawal of hot water at the same storage temperature and having gone through the same temperature rise in the same heater.

What happens to the monthly gas consumption per gal. when, with a given number of gal. withdrawal from a given size of automatic heater but with different storage temperatures, the "cold" water inlet is constant thus resulting in a variable temperature rise? More



gas per gal. must be used since more "useful work" is performed. The question of how much more is depicted in the following chart:

The foregoing shows gal. per mo. plotted against both gas consumption per gal. and per mo. for three different thermostatic settings, 125°, 140° and 155°. Since the inlet water was at 50°F. in each case, the temperature rises were 75°F., 90°F. and 105°F. respectively. Thus for 1,800 cu. ft. of gas per mo. 840 gal. can be had through a 75°F. rise at 2.14 cu. ft. per mo.,

or 600 gal per mo. through 90°F. rise at 3.00 cu. ft. per mo., or 365 gal. per mo. through a 105° F. rise at 4.95 per gal.; i.e., for the same amount of gas any of these three quantities of water can be had depending upon the thermostatic setting. Now at a fixed rate of water withdrawal say 1,200 gal. per mo., the respective gas consumptions shown on this chart are:

Thermostat Setting	*Temperature Rise*	*Gas Consumption, cu. ft. Per Gal.*	*Monthly*
125°F	75°F	1.97	2,365
140°F	90°F	2.57	3,080
155°F	105°F	3,12	3,750

thus clearly indicating the effects on gas use of variable temperature rise for the same volume of hot water.

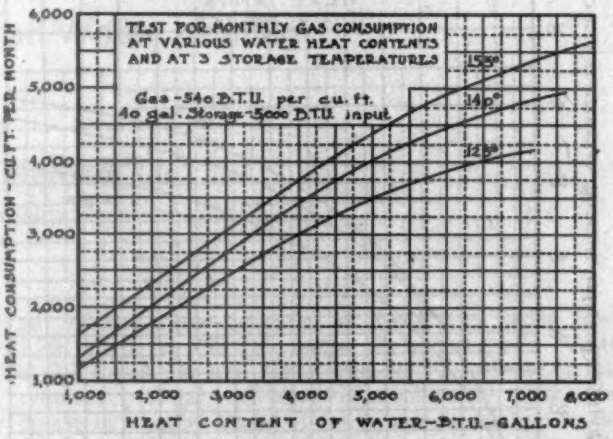
A close inspection of and calculation on the foregoing tabulation indicates that the increase in the gas consumption is out of direct proportion to the increase in the temperature rise. For instance, the difference between a 125°F. and a 155°F. storage is 30°F., which with a constant inlet is an increase of 30÷ 75 = 40% in temperature rise. If then the increased gas consumption were directly proportional, the increase would be 2,365 × .4 = 946 cu. ft.; whereas the increased gas consumption actually is according to the chart 3,750 — 2,365 = 1,385 cu. ft., or 1,385 ÷ 2,365 = 58.6%. From this, then, it can be seen that the gas consumption increases at a greater proportionate rate, in fact in this instance (.586 — .40) ÷ .4 = 45% faster than the temperature rise or in this case the useful work performed.* The moral then is beware of high temperatures—they cost more than the benefits received.

Unavoidable Fluctuations

Because of the unavoidable fluctuations encountered in temperature rise, due to seasonal variations in inlet water temperature, it is felt that some means must be evolved to show gas consumptions at various withdrawals, taking this variable temperature rise factor into account. For this purpose the slightly academic term "Btu.-gallons" has been "fished out of the nowhere" to designate the used heat content added to the water. However, the phrase is simple enough, the term "Btu.-gallons" being but the product of the average number of gal. withdrawal per day multiplied by the number of degrees of temperature rise. Thus, a case example, if it is assumed, let us say, a 40 gal. hot water withdrawal per average day, on which the thermostat setting was 140°F., and the inlet water at 65°F., then the temperature rise is 140 — 65 = 75°F. and therefore, the "Btu.-gallons" is 75 × 40 = 3,000 Btu.-gal. For ready reference the following chart is presented merely to show characteristic gas consumption at variable temperature rises and water withdrawals, or Btu.-gal. with a fixed size and heat input:

To illustrate the use of the above test data—assume an average daily hot water withdrawal of 45 gal., an inlet of 65°F. and a storage temperature of 140°F., then the temperature rise is 140 — 65 = 75°F., from which the Btu.-gal. = 75 × 45 = 3,375; then from the chart above at 3,375 Btu.-gal. proceed vertically to the 140°F. curve and, hence, horizontally to the left where the gas consumption reads 3,100 cu. ft. per mo. Thus it can be seen that with this type of chart the monthly gas consumption of the heater itself can be arrived at accurately with the volume of water, the inlet temperature, and the storage temperature known.

The foregoing chart emphasizes again the poor econ-



omy of high storage temperatures.* To support this statement let us take the gas consumption from the above chart at 3,000 Btu.-gal. (say 40 gal. per day at a constant 75°F. rise thereby involving different inlet temperatures), which, for respective storage temperatures of 125°F. is 2,365 cu. ft., for 140°F., is 2,750 cu. ft., for 155°F. is 3,060 cu. ft.* In each of these three cases the Btu.-gal., or heat content added to the water, is identical, which is the same thing as saying that although the storage temperatures varied, exactly the same amount of useful work has been accomplished.** Once again the conclusion is to beware of high storage temperatures.

Theoretically, a housewife will use less hot water at, say, 150°F. than at 120°F. Field experience, however, establishes the fact that the use is only seldom reduced in proportion to the reduced added heat content incident to lower temperature. Practically, then, gas consumption is increased not only by the increased temperature rise but also by the substantially increased inherent standby loss (up the flue and through the walls) at the higher storage temperature. To this higher temperature higher piping system loss as well as magnified cost of dripping faucets and carelessness are imposed. Essentially every material consideration favors carrying the water at a temperature just sufficient to afford the user adequate service.*

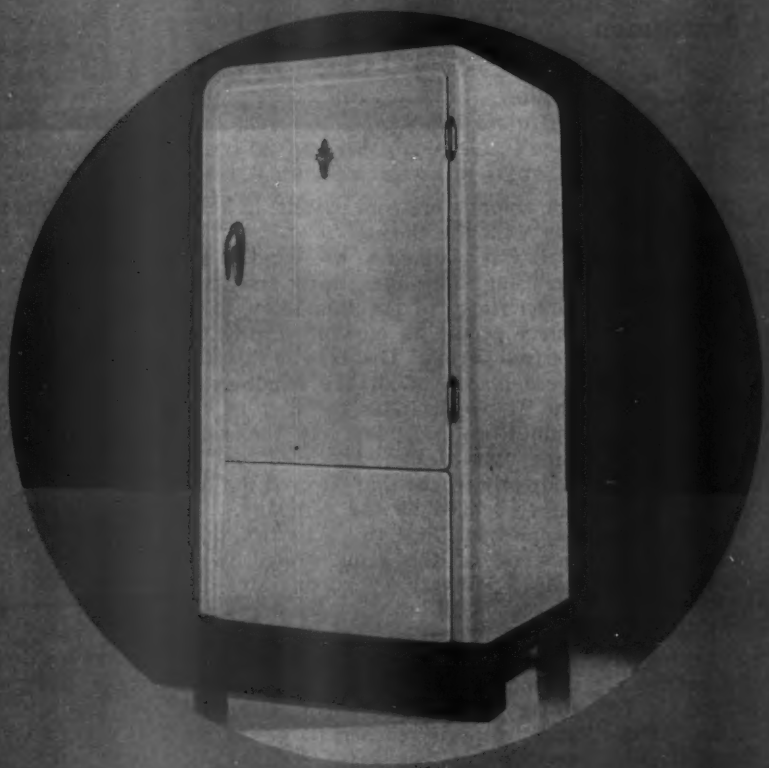
(Continued on page 48)

**Strict technicalities demand that in addition to storage temperature and rate of heat input, the thermal efficiency is affected by a third factor, i.e., the temperature rise. Manifestly the greater the temperature rise the longer the main burner will have to operate to bring a given quantity of water up to the thermostatic setting. The result is that the greater number of hours of operation, the fewer the hours of standby with consequent effect on monthly service efficiency. This fundamental is made apparent by studying the succeeding chart on Btu.-gallons. Anyone having a mania for such "deep stuff" is referred further to "Service Efficiencies of Automatic Storage Water Heaters," page 214, June, 1935, issue of Am. Gas Assoc. Monthly.*

**The author wishes to express a debt of acknowledgment to John Wood Mfg. Co. in whose laboratory the tests were conducted from which data was secured for the preparation of the second, third and fourth charts contained in this article. These charts, however, are employed here solely to illustrate the basic principles involved and are not to be used either for comparison with other makes or for determination of an actual gas estimate in a given home. It is recommended that for actual field practice that recourse be taken to the manufacturer whose product is being handled for efficiency data of this general nature.*

***In the following only those with a passion for mathematical niceties are invited, this sufficing only to "prove the case" that by comparing the Btu.-gal. chart with a "fixed inlet temperature chart" it can be demonstrated that by taking into account in the "fixed inlet" chart the actual added useful work represented by the three storage temperatures there shown, the Btu.-gal. chart is an inevitable conclusion—further proving that increased gas consumption caused by the higher storages are thermally a pure waste.*

GAS REFRIGERATION SALES CONTINUE TO ZOOM!



. . . 1935 Air-Cooled Electrolux wins new friends from coast to coast with its greater beauty, efficiency and convenience

NOW it's certain . . . *this is gas refrigeration's year!* Sales for 1935 are far outdistancing those of 1934 . . . and last year was a record-breaking year. From almost every section of the country come reports of tremendous gains . . . and 1935 is only half over!

The hot summer months ahead provide a valuable opportunity to capture an even larger share of the refrigeration market for *gas* refrigeration. These dog days when families realize more than ever their need for modern refrigeration are the psychological time for your salesmen to talk "Electrolux."

For Electrolux offers families everything other refrigerators offer . . . and more! Its sparkling beauty is winning the hearts of more and more women every day. Its worth-while conveniences set a new high for refrigerator value. And, in addition, Electrolux has those important operating advantages . . . low running cost, permanent silence, no moving parts to wear.

The extra effort which your company puts behind Electrolux during the coming months will repay you many times over. For assistance in forming your sales and merchandising plans, write, wire or phone to Servel, Inc., Electrolux Refrigerator Sales Division, Evansville, Indiana.

NEW *Air-Cooled*
ELECTROLUX
THE SERVEL *Gas* REFRIGERATOR

KEEP COOL

With a hot weather poster advertising theme

by Stuart Bratesman

Manager, Display Dept.
Boston Consolidated Gas Co.

HOW can the average gas company utilize the "relief from heat" theme in merchandising appliances and service during these hot months? Unlike our electric brethren, we have no direct relief themes like fans or small wares, but we have two appliances, which if presented in the right manner, can do a lot to beat the hot weather.

The fully insulated oven gas range and its cooler kitchen angle, and the automatic gas refrigerator with its ice cubes and frozen desserts theme, are our two big hot weather stories.

Here's a poster program used by one gas company during this past hot spell that might be of interest, as it goes into the matter in complete detail. A theme, "Keep Cool," was decided on as a copy headline. To illustrate this idea, a poster treatment of a cool young man in palm beach and panama was used in the the three selected media. Naturally, the colors were cool pastels, in keeping with the theme.

It was planned to use window advertising, floor advertising and truck advertising, to get this story to as many people as possible during the desired period. Displays on this idea were placed in all key windows of the system as near the first of the month as possible. At the same time, the design appeared on all company trucks that covered the territory served by the company. To supplement these two activities, floor posters, of the same design, were placed on every gas refrigerator displayed on all branch sales floors and the permanent display of refrigerators on the main sales floor. In this manner, the message was presented to the greatest number of consumers and prospects reached by poster advertising.

Outdoor advertising was not used in this particular campaign due to budget limitations. Car cards were considered, but abandoned, for the same reason. Summer advertising budgets usually do not reach the figures of fall and winter appropriations. The average small gas company seldom uses these last two media anyway, so the writer is concentrating on the practical application of the campaign to these companies.

The photographs accompanying these lines clearly show how this "Keep Cool" theme looked in the three media, window display, floor display and truck poster.

You will notice that no attempt was made to merchandise any additional features of the refrigerator in these designs. They concentrated on this heat relief idea, exclusively. It was felt that if the campaign "got over" this one thought it would prove of more interest to the wilting public than the usual sales features so often used. Developments bore out the logic of this thought. Indirectly, it proved a bigger direct sales theme than if the copy had been written the other way.

The entire cost of this effort was absorbed by the poster budget of the Display Department, and did not represent any additional expenditure. In other words, for the selected period, all production in this department was concentrated on this summer theme.

Proportionately, your own company could use this summer theme, in your windows and floors and trucks. Give it a try,—it's a very logical merchandising idea, and if you don't think the average person likes to read a restful, cool advertising message, with the thermometer registering 90°, you don't know your human nature.

"SUCCESSFUL SELLING"

Testimonials and Comic Strip Cartoons Sell House Heating Equipment and Automatic Water Heaters In Arizona

By LUCIUS S. FLINT

A SATISFIED user will say more in favor of natural gas house heating than any utility company would dare to say without fear of contradiction. That's why the gas department of the Central Arizona Light and Power Co., Phoenix, Arizona, chose an unusual type of local testimonial advertising campaign as the principal vehicle for what promises to be a highly effective summer house-heating drive. If business continues to come in at the present rate, the Arizona property will have increased its sales about 100% in 1935 over 1934.

Every testimonial used in the campaign is one actually written by the customer without help from company representatives. Many people offered to sign anything the company men cared to write but these propositions were refused. At the beginning of the drive, it was decided to make the plan a 100% honest one which nobody could take exception to. The only deletions made were names of competitive fuels, where they were mentioned in customer letters. In such instances, blank spaces were left and it was stated that the original letters could be seen at the company, should anyone care to examine them.

Testimonials were solicited by the salesmen in the various districts. A small prize was presented to every customer who took the trouble to write a letter. A major prize of a set of copper cooking utensils was awarded for each letter published.

Three testimonials are being run each week. One other ad per week is used on house heating—this one telling in greater detail, the plan of summer selling. No payments are required until October. The campaign is built around the idea of buying now and saving 10% as well as solving the heating problem before the busy, fall season arrives.

Only one testimonial is used to an advertisement. The whole ad is built around some important feature stressed in the letter published. For instance, here are a couple of representative headlines, both run in quotes: "We really saved money by using gas for fuel," and "No disagreeable Odors of any Kind." Appeals are made on various types of installations in the different ads. Some contain letters from users of floor furnaces, in which case, the balance of the ad is built around this type of unit. Others feature furnace conversion jobs, boilers and so on.

Under the main headline in which the important feature from the letter is brought out, appears the name and address of the customer. The letter itself is usually run at the left side of the ad. The right is devoted to a couple of illustrations showing the home in which the equipment is installed and the person who wrote the letter. All illustrations are carefully posed, showing the actual equipment whenever possible. For instance, one illustration shows two women sitting beside the floor furnace. An exterior view of the house is always used. Sometimes, the customer is "shot" in an informal pose, such as holding a pet dog.

HOT WATER PRIMER
By Tiny
Great game golf! The best part of it is the nice hot bath...provided of course that you don't have to wait around for an old tank heater. Trade in your old waterheater on an Automatic Gas Waterheater or rent one for $1.25 per month. Dial the Gas Company.....3-3121

Blue Blaze Scotty

In every ad is used a sort of company trademark, a drawing carrying the name of "Blue Blaze Scotty." The head of the figure represents a blue, gas flame. The body is a caricature of a canny Scotman in kilts. The latter was used in comparing the cleanliness and thrift of the Scotch with these qualities in a gas house-heating installation.

The company was "joshed" a great deal about the summer appeal so it was decided to capitalize on this fact in an ad carried out in a humorous vein. It was illustrated by a sketch of "Blue Blaze Scotty" dressed as an Eskimo. The copy compared selling gas heat in the summer to selling fans to Eskimos but went on to explain the value of the summer purchase plan. The same thought was carried out in a radio skit. A man and woman were discussing the subject. The husband ridiculed the summer appeal and the wife convinced him that it was logical. Great care was taken to make the conversation thoroughly life-like.

Exceptional results from the present campaign may be traced in some measure to the care with which the Arizona property proceeded in its last year's selling. Since manufactured gas rates had been comparatively high, the company faced a real problem in making Phoenix "gas heat minded." With future results in mind, great care was taken to see that every job "stayed sold." For instance, before the first gas bill was delivered, its amount was checked with the estimate given at the time

YEE-O-O-O-W!
That's one way of expressing yourself when the warm shower suddenly turns icy. An Automatic Gas Waterheater will furnish enough hot water for a whole flock of warm shiverless showers.. economically too! Rent or buy one from the Gas Company. Dial 3-3121

of installation. In only five cases out of 600 did the actual figure exceed the estimate. And, in those instances, the difficulty was immediately corrected through adjustment. Consumer satisfaction may be judged from the fact that there were only three removals out of 600 sales.

Service Girls Will Instruct in Usage

As a further means of guaranteeing consumer satisfaction, particularly on gas ranges, the Arizona company will this fall inaugurate an unusual type of installation follow-up plan. Three specially trained girls who are now doing survey work for the electrical department will have their duties extended to include making follow-up inspection calls on every range and other major appliance installation. If a customer doesn't know how to use the new type appliance to best advantage, the company girl will don an apron and give the patron a practical demonstration. The plan is designed to overcome lack of complete satisfaction among customers who have been used to old-type, quick-heating, uninsulated ranges.

Cartoons Feature Water Heaters

Experience shows that automatic water heater business usually comes in spurts. The Arizona property has made this item a year-around good seller through another unusual type of advertising: a cartoon feature run on the comic strip page of the morning newspaper. Two such ads are used each week. In addition to keeping up a steady volume of direct sales, the plan has encouraged plumbers to sell automatic heaters instead of the old-type units.

This campaign was launched as a follow-up for what proved a highly effective rental plan. The rentals were put out on a privilege to discontinue service or to buy basis. The rate is $1.25 per month.

One of the first cartoons showed a woman bending clear to the floor to light an old type water heater. The copy read: "Watch her jump when it pops." Another one showed a man

"My Scotch Instinct tells me the economy of Automatic Hot Water is as pleasing as its convenience." Your own pocketbook will like the low cost of Automatic Hot Water, just as you will enjoy the convenience and comfort of an everready supply. Dial 3-3121 and rent an Automatic Gas Waterheater for only $1.25 per month.

This gentleman is about to postpone his morning bath for the fourth time this week! The clock says he cannot wait for the old tankheater to warm up his bathwater. An automatic gas water heater would have plenty of hot water ready every morning. The gas company rents them for $1.25 per month ..... dial 3-3121

holding a garden hose, from which steam was gushing. "Hey, somebody forgot to turn off the water heater!" he was yelling.

After the cartoons were started as a regular feature, this title was adopted, running on every ad: "Hot Water Primer—By Tiny." One of these cartoons showed a baby hanging onto his mother's hair as she tried to put him into the bath tub. Copy ascribed this to cold water. Another showed a man holding an alarm clock. The story was that he had to miss his morning bath because it took too long for the water to heat with an old type heater.

The Colonel's Commentary

By Wm. H. Matlack

One company is reported to have turned from the two and three times a week schedule of newspaper advertising to spread its advertising out over the entire week. This is being done through the use of smaller advertisements. Instead of having two or three big shots each week they now shoot every day and it is said that the plan holds enough promise to make it a regular thing with this company.

* * *

A jobber's salesman was telling me the other day about a central station salesman who is financially independent of his job. (Sounds like a dream, doesn't it?) When I asked: "How come? Did they strike oil in his back yard or has a sick relation died and mentioned him in his will?" He said: "No, the fellow simply has attended to his 'knitting.' He keeps his card index file on all his customers and prospective customers. He keeps his card index on his prospects to assure him of a daily commission and on his customers to keep them sold and enable him to carry on his fixed expenses. On a card of his own design he files the name and address of every one to whom he makes

a sale of any appliance. One day each month he devotes to what he calls his 'keeping them sold' work. On this day he calls each customer that he has sold an appliance of any description during the previous thirty days, to ascertain whether or not the purchase has proven satisfactory. Whenever a customer has a complaint, he makes a personal call to adjust it. Thus, through interest in his customers, he has built up a valuable clientele. Aside from showing just what appliances his customers have purchased, and when, his card file affords him a live list at all times for mailing leaflets and booklets advertising new appliances." This idea has been used by the writer with good success and while he is by no means financially independent of his job, he is willing to attest its value and to commend it to anyone.

* * *

When you create a good newspaper, install a good window display, both featuring an item on which you wish to boost sales, and fail to work out an attractive store display and a *regular* sales talk for those your advertising attracts to your store, you are wasting a lot of good time and money—think it over. August promises to be an excellent month for the sale of gas ranges this year, if the number of companies who are going to stage gas range sales during this month is any indication of what is to be. Wherever you go wherever you may have been recently, you have heard gas men talking about plans for gas range sales during August. It would seem that at least the gas man has come to the conclusion that "The gas range knows no season." Aside from gas ranges, we expect to see the old sales score for water heaters and incinerators hit a new "high" between now and the time the books are balanced at the end of the year.

* * *

If you have a Home Economist, try to work out a plan whereby she will supply the newspapers with a column of tested recipes for their weekly food page, as well as special information regarding the use of special cooking appliances. If you are seeking help to carry on your range campaign, run through the pages of this magazine as it reaches your desk each month, turn to the advertising pages and also go through back numbers on file in your office. You will find many, many ideas which may be fitted into your plan to sell gas ranges this year as you have never sold them before.

* * *

One Organization that we know of is using a mimeographed company house organ to tell the story of modern cookery to every one of its employees. This house organ consists of a single sheet and is enclosed each month with the employees pay check. We understand that while no special effort has been made to sell employees new ranges, several have purchased them through a desire for the newest and best as portrayed in this sheet.

* * *

We have seen some reproductions of posters used by the Consolidated Gas Company, New York, designed to help the plumber-dealers about Manhattan and we say they are mighty effective. Looks like that is a good way to sell more gas per meter and to interest the plumber in selling refrigeration and automatic hot water service.

* * *

AN OFFICIAL COMMUNICATION FROM

GAS, KANSAS

"An official communication from Gas, Kansas" (see illustration) is a clever attention-getter produced by M. M. Scott of the Ruud Company. "Scotty" tells the gas men what the summer stars have in store for the water heater salesmen who will expose themselves to sales. Speaking of water heating advertising brings to mind a clever d. m. piece created by the Philadelphia Gas Works Company to sell the new instantaneous gas water heater, under a heading of: What is it? A mail box? A robot? A Fire Alarm? A Traffic Signal? If you have not seen these two pieces, you have missed something.

Recently another step toward furnishing every St. Louis County home with automatic hot water service was made by the St. Louis County Gas Company. This step was taken when that company offered the new conversion type heater on a rental plan. These heaters are rented on the optional purchase plan which is gaining popularity in many sections of the Country. Its a good idea not to let any business get by and we predict many rental plans will be introduced during the coming months.

* * *

1500 Gas Ranges Replace Electric Stoves in Florida

"In three years, the Peoples Gas Company, Miami Beach, Florida, has replaced 1500 electric stoves with gas ranges, increased its meters from 1600 to 4600, installed as high as 500 new gas services in one month and in one day had a gas send-out of 1,250,000 cubic feet. These accomplishments were all effected during the very heart of the depression and in the face of bitter electric competition. In a single month, 48 electric stoves were taken out of an apartment and replaced with gas ranges.

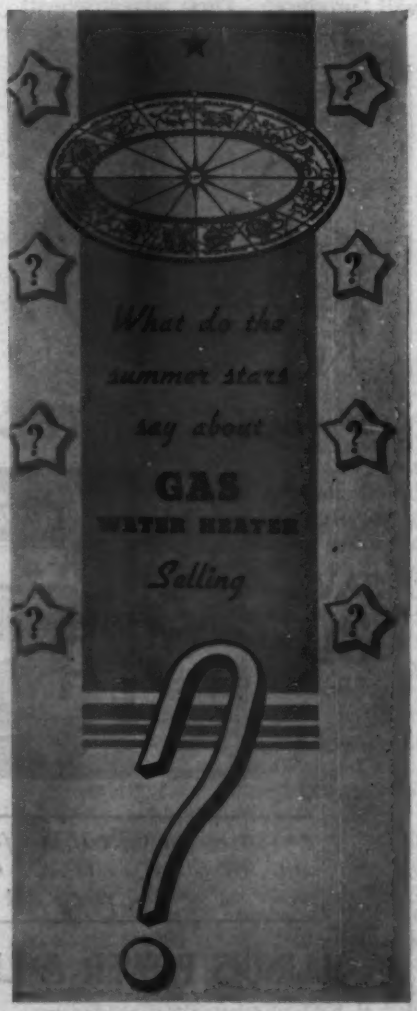
"This remarkable record has been achieved under the managership of C. D. Littlefield, a tireless worker whose industrious spirit is an inspiration to the entire organization."

:—MAGIC CHEF Magazine.

There's something for you fellas to think about!

* * *

The Peoples Light Company, Davenport, Iowa, has issued a very interesting booklet, "The High Cost of Not Having Natural Gas Heat." Gas men who are fortunate enough to have received a copy of this booklet will agree that it's a potent piece of sales literature.



Cover of Water Heater Booklet.

Sales people who have a pleasant word, a smile, a friendly greeting, are the ones who make the cash register ring and keep the customer sold. Try these little things. They cost nothing and are very essential in selling.

* * *

If your advertisements are clean, cheerful and truthful, folks will respect them when they appear in newspapers, or in the form of direct mail pieces. Folks will show this respect by reading your ads.

* * *

Some of the gas range manufacturers are going to the front for gas cookery. Two recent plans to promote the continued use of gas cookery and create new cookery customers are a "Radio School of the Air" broadcast on Tuesdays and Thursdays and a "Kitchen Planning Service" that provides the housewife with complete working plans for modernizing her kitchen.

* * *

From La Salle, Illinois comes a range advertisement that we believe will produce. This advertisement strikes at the "afford" angle and goes right to the mat with an offer that should appeal to the woman who needs a new range yet hesitates to purchase because she does not wish to disturb her budget.

* * *

Gas appliance dealers sell more merchandise to women than to men. It is for this reason that they should thoroughly understand the feminine viewpoint, buying motives and appeals.

* * *

The store that is well lighted indicates progressiveness,—while the store that is poorly lighted denotes slovenliness and says the manager is lazy. Good light is about the least expensive thing that today's live retailer can purchase. A modernly illuminated store gets over a big selling message.

* * *

One salesmanager found that his men wasted a great deal of time in telling women about the construction features of gas ranges and by changing the selling talk to one predicated on "what it will do for you," the orders were immediately increased.

Tush, Tush, Lady—
of Course you can afford it"
YOU may also save $30.00
ONLY $64.50
Cash
LOOK AT THESE FEATURES
Magic Chef
SAVE $30
SAVE $30
This Special Offer is in effect ONLY while our stocks last. We advise you to ACT QUICKLY if you wish to secure one of these ranges and make this BIG SAVING.
ILLINOIS POWER & LIGHT CORPORATION

As purchasers of merchandise for resale for the past two or three generations, gas appliance dealers should be conversant with the fact that Woolworth has capitalized the low price to broaden his market and secure a greater turn-over for small items,—while the appliance market is one in a higher bracket and where turn-over is much less—he therefore should strive to sell *value*.

* * *

A state of mind plays havoc with the home manager just the same as it does with "the hoped to be big butter and egg man," in the matter of easy money and a stock market. Gas men who are progressive will give this fact due consideration during the coming months of readjustment and throw a goodly sum of money into the promotion of sales through advertising. If there has ever been a better opportunity for advertising men to demonstrate the power of the printed word, history tells us nothing about it. Advertising men, who, through truthful, thoughtful copy, can keep the customer coming, are going to be of untold value to the gas industry and business at large, during the coming months. Advertising, as we view it, is the business of creating states of mind. If, during the coming months, we are able to stay the desire to do without, for fear there may come a period of deeper depression, by judicious advertising, we will have done a worth-while work. Do not let down on your newspaper and window display advertising during the coming months.

* * *

Department and chain stores require their merchandise men to visit the stores of other merchants at regular intervals. . . . The idea being to make them familiar with what the other merchant is doing in the way of displaying merchandise, store arrangement and serving the customer. This, it seems, would be a good idea to apply to the gas merchandise man—but, oh well . . . some day there will be a merchandise man turned loose with a free hand in one of the big gas companies; and, then look out!

* * *

Franchise Renewal

By a vote of more than two to one, citizens of Pueblo, Colorado, at a special election on July 23, granted to Southern Colorado Power Company a twenty-five year renewal of its franchise.

Tenant Paying Refrigerator Fuel Bill Increases Sale of Electrolux

By George H. Watson

BY helping break down a long established custom between landlord and tenant—that of the landlord paying the refrigerator fuel bill—the Birmingham Gas Company recently has been able to vastly extend its sale of Electrolux refrigerators to apartment house owners in its territory. With this practice being gradually eliminated the utility is selling carload after carload of gas refrigerators.

As long as landlords paid the bills they usually preferred to have electrical refrigerators with a single power unit in the basement. But the gas company argued that landlords should no more be required to furnish fuel for refrigerators than for ranges for which it has never been the custom for the landlord to defray the operating cost.

With rents low, taxes high and interest heavy landlords have been more willing than ever to listen to a plan designed to save them money, such as the shifting of refrigerator fuel bills to the shoulders of their tenants. The tendency of rents is now upward and the utility has argued that making the tenant pay the refrigerator fuel bill is one way of raising the rent with a minimum of protest that usually follows such a step.

In order to help change such a practice and for other reasons the gas company found it expedient to become an associate member of the Birmingham Real Estate Board. Forrest Carlisle, supervisor of the wholesale division, working under W. A. Hudson, general sales manager, attends these meetings and mingles freely with the real estate agents into whose hands are given the management of most of the larger apartments.

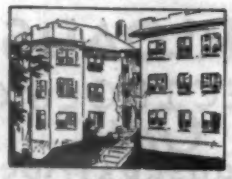
"As soon as the apartment house owner or manager could be brought around to the wisdom of letting the tenant pay the operating cost of the refrigerator the next question centered around the type of refrigerator to install," said Mr. Carlisle. "That is where we were able to put in some telling sales talk for the gas refrigerator.

"For one thing we could argue that the utility services all gas appliances, taking any responsibility in that respect off the shoulder of the landlord or tenant. Next we had silent refrigeration to offer which is important where an apartment is small. These two advantages alone have turned several apartment house sales our way.

"We have of course found it necessary to answer some objections to gas refrigeration as usually raised by competing electrical dealers. First is the danger from explosion should the gas flame in the refrigerator come in contact with gas escaping from the range or other gas appliances in the kitchen. Usually the well publicized case of a New York suicide is cited as an example. Our reply is that the insurance companies don't worry about such an eventuality and why should the landlord or tenant. And besides if necessary we point out that an arc or spark from an electric refrigerator could cause the same type of explosion.

"Another objection raised by our competitors is to the heat generated in a small apartment by the gas flame. Our reply to that is that the heat generated is negligible and that the friction on the moving parts of an electrical refrigerator also generate heat. We usually find it best

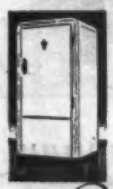
COUNTRY CLUB
3218 Country Club Terrace


ELMHART
1900 12th Ave., S.

NELRIGHT
1301 S. 20th St.

VIRGINIAN COURT
1027 S. 20th St.

LURAY
1208 N. 20th St.



Prominent Birmingham
APARTMENTS
MODERNIZED THROUGHOUT WITH
Gas REFRIGERATORS

Exclusive advantages of Electrolux Gas Refrigerators appeal so strongly to J. Warren Leach & Company that they have recently modernized five leading Birmingham apartments with Electrolux. Absolutely silent, economical and dependable refrigeration for tenants, with minimum cost of maintenance and depreciation for the owners, makes an unbeatable combination for apartments as well as for private homes. Electrolux has no moving parts to wear out or need repair. . . no motor, no compressor, no fan—a tiny, inexpensive gas flame is its complete "power plant."

Prices begin at $129. Sales in Birmingham this year exceed all previous records. Electrolux Gas Refrigerators may be purchased on our easy monthly payment plan. Telephone 7-7181, or come by for details.

"BEST REFRIGERATION WITH LEAST COST"

"Birmingham, Ala., May 28, 1935

"Birmingham Gas Company:

"As you know, we recently purchased from you Electrolux Gas Refrigerators for the Elmhart, Nelright, Luray, Virginian and Country Club apartments.

"In line with the policy of our company, these refrigerators were installed to afford our tenants the most modern equipment, as well as to give them the best possible refrigeration service with the least cost to our apartment house owners, over a period of years. The selection was made after careful investigation of popular makes of refrigerators now on the market.

"We wish to congratulate you upon the service these refrigerators are giving our tenants, and also on the efficient manner in which they were installed.

"Yours very truly,
"J. WARREN LEACH & COMPANY,
"222 North 21st Street."

BIRMINGHAM *Gas* COMPANY

Birmingham Gets

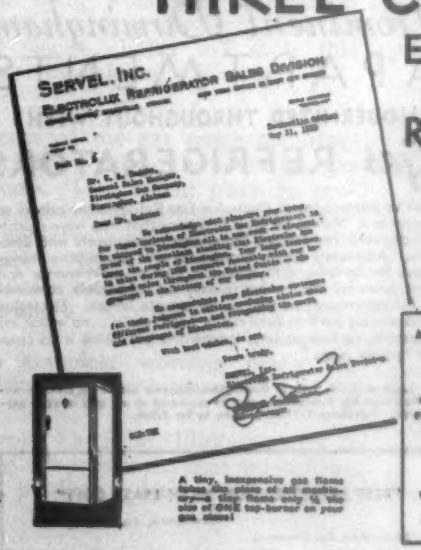
THREE CARLOADS

ELECTROLUX

Gas

REFRIGERATORS

in one week



Electrolux sales in Birmingham so far this year exceed all previous records. Birmingham housewives are becoming more and more enthusiastic every day about Electrolux, exclusive advantages. It has no motor—no fan—no compressor, to wear out and need repair. It is permanently silent . . . has low cost operating cost . . . is beautiful in design, with all modern conveniences.

LOWER IN PRICE THAN EVER BEFORE

Current retail prices of Electrolux now are lower on popular sizes than ever before in Birmingham. This is the time to buy. You are paying for an Electrolux even now in your present refrigeration costs. Have it installed now.

Monthly Payments Less Than Your Present Refrigeration Costs

Size for Family of	Monthly Payments	Daily Amt.
2 to 3	$5.00	16¢
3 to 4	5.83	19¢
4	6.41	21¢
5	6.92	23¢
6 or More	$7.50	25¢

Prices Begin At $103

A tiny, inexpensive gas flame takes the place of all motion, wear, noise. Many Thanks today to the use of ONE top-burner on your gas stove!

BIRMINGHAM *Gas* COMPANY

to answer such arguments in the beginning so as to disarm both the customer and the competitor.

"Since an apartment house is purely an income proposition the biggest arguments we have to offer in the sale of gas refrigerators is that the first cost is the last cost. This is true because the tenant pays the fuel bill and we service the equipment. With these facts established landlords realize that they can amortize the cost of new boxes in a few years by the savings realized in fuel bills.

"Changing rental customs has been a slow process, but it now appears that within a short time the old practice of the landlord paying refrigerator costs in Birmingham will be a thing of the past. A number of apartments have been remodeled this year making it convenient at the same time to change the type of refrigeration. Besides negotiating with the agent we have found it necessary in a number of instances to carry on correspondence with insurance companies which have taken over a number of the apartment houses."

One Birmingham realty operator recently modernized five of his leading apartments with Electrolux refrigerators purchased from the gas company.

STANDARDIZE

on

SPRAGUE CAST IRON GAS METERS

and

REGULATORS

for

low, medium, and high pressures

Accurate in Measurement.

Economical in Service.

THE SPRAGUE METER CO.

BRIDGEPORT, CONN.

New Law of Gas Rates

(Continued from page 29)

Pursuant to the provisions of the Ohio Statutes, the West Ohio Gas Company, which supplies gas to the inhabitants of the city, filed a complaint with the Public Utilities Commission protesting against the ordinance. Hearings began before the commission in July, 1928, and ended in July, 1932. The result of these hearings was that the Public Utilities Commission on March 10, 1933, found the rates prescribed by the ordinance to be insufficient, at the same time declared that the rates being collected by the company were excessive.

The commission thereupon prescribed a schedule or rates which, in its opinion, would yield a return of approximately 6.65 per cent per annum to the West Ohio Gas Company for the furnishing of gas to the city of Lima, Ohio, this schedule being as follows:

For 400 cubic feet or less per month..$1.00
For the next 9,600 cubic feet ..... .95 per M.C.F.
For anything in excess of 10,000 cubic feet per month ..... .75 per M.C.F.

with penalties if payments are delayed.

The company then appealed to the Supreme Court of the United States on the grounds that the rates, established by the Commission, were too low because after the Commission had established the rates it had been discovered that certain items of operating expenses were erroneously excluded in figuring company's return, and that such exclusion would reduce company's return to approximately 4 per cent.

The Supreme Court of the United States found that the total of these reductions was $23,125.25 annually and that, when these expenses were added to the operating charges the average net income of the company involved was considerably reduced, and the rate of return was reduced to approximately 4.53 per cent upon the rate base of $1,901,696.26. The Court held that this rate of return was too low to satisfy the requirements of the Constitution when applied to a corporation engaged in the sale of gas during the years 1928 to 1931.

On further appeal the higher Court of Ohio directed the Public Utilities Commissions to increase the rates to allow a net income of 6 per cent, and said:

"It will appear that the schedule of rates prescribed by the Public Utilities Commission of Ohio to be charged by the West Ohio Gas Company in the City of Lima, Ohio, for the five-year period involved is insufficient for the purpose of returning to the company a return upon the rate base of $1,901,696.26. It will therefore be necessary for the Public Utilities Commission of Ohio to prescribe a new schedule of rates to be charged to gas consumers in the city of Lima, Ohio, for the five-year period beginning April 19, 1928, which will yield to the company an annual income of not less than $109,414."

When Rates Are Discriminatory

Considerable discussion has arisen from time to time with respect to the legal right of a gas company to classify its consumers and establish different rates for consumers in different classifications.

It is generally known that innumerable considerations enter into the question of determining rates to be applied to the services rendered to the public by public utility and gas corporations. In fixing its rates, the distributor of gas must consider the cost of its product to the company as well as the ability of the consumer to advantageously use it in his business; the competition the distributor must meet from the distributors of other fuels, such as wood, coal, oil, electricity as well as the competition the consumer must meet from others engaged in similar business; the volume to be supplied; the cost of distribution; the reserved right of cut-off in emergency; and the like.

Therefore, a consumer cannot complain that a rate is discriminative, or so unreasonable as to warrant a suit for overcharge, without clear proof that others operating under similar conditions and circumstances have the benefit of a lesser rate. And particularly, it is true that a gas company may without discrimination establish a lower rate to a classification of consumers whose service is less expensive, or with less hazard, than service supplied other consumers.

For example, in Wolf V. United Gas Public Service Co., 77 S. W. (2d) 1091, a gas company adopted the following classifications of gas consumers, and schedules of gross rates per 1000 cubic feet: Domestic, 75 cents; hotels, restaurants and bakers, 60 cents; industrial establishments as boilers, brick kilns, etc., over 25 horse power, 25 cents.

The owner of a bakery, whose scheduled rate was 60 cents per M. C. F., knew of the rate being charged others, and while paying the bills as rendered, was constantly protesting the rate as being excessive and discriminatory.

The bakery owner filed suit against the gas company to recover the amount of the difference between the 60 cent rate paid from September 1, 1928 up to the present, and 25 cents per M. C. F. It is important to know that the higher Court held the owner of the bakery obligated to pay the 60 cents M. C. F. rate.

GAS SERVICE STOPS

SINCE 1869 Hays has built dependable brass products for the Gas Industry. Standard, Special Weight, Heavy Pattern and High Pressure Stops to meet all requirements are manufactured by Hays in a full range of sizes. Write for Catalog No. 4 today.

HAYS MANUFACTURING CO. ERIE, PA.

PURIFYING MATERIAL — BAGGED, OR IN BULK
Manufacturers of GOVERNORS, APPARATUS and EQUIPMENT
IRON SPONGE
Connelly Iron Sponge and Governor Co.
Elizabeth, N.J.
Chicago
1876 [USE THE BENEFIT of 58 YEARS EXPERIENCE] 1934

NEWS of the GAS INDUSTRY

Five Regional Sessions of N. Y. Gas Association Will Start October 18

The New Jersey Gas Association will hold its next regional meetings during the five weeks period starting October 18, P. D. Gardner, chairman in charge of arrangements for the meetings, has announced. The meetings will be held in Newark, Hackensack, Allenhurst, Camden and Atlantic City.

Upwards of 1,500 attended the five regional meetings of the Association last November. This was a record attendance. Hackensack had the largest crowd, more than 500 attending the meeting in the auditorium of the Hackensack Y. M. C. A.

Announcement has also been made by the New Jersey Gas Association of a prize paper contest. H. D. Polhemus is chairman of the committee appointed to work out plans for the contest. G. M. Peterson and R. W. Lee are also members of this committee.

Herbert E. Cliff, assistant to the auditor, Gas, Public Service Electric and Gas Company, is president of the Association.

Gas Franchise Renewed

The Crisfield Light & Power Company of Crisfield, Maryland, renewed its franchise in June for another 25 years.

The plant had been in operation for 25 years and the franchise having expired in June, City Council and the Management of the Company got together and worked out, in amicable fashion, a new franchise. Mr. N. Henry Gellert, President of the Company, conducted the negotiations with the City Council.

New Gas Cleaner

A new simple, positive and economical type of gas cleaner or scrubber has recently been developed by the Fluor Corporation of Los Angeles. It is claimed by the manufacturers that this Cleaner will remove over 99% of the moisture and dirt in the gas stream.

These Cleaners are available in two types. Sizes are predetermined by the volume of gas to be handled. Because of their simple, fool-proof construction and freedom of moving parts, they may be operated 24 hours a day, day in and day out.

It has no complicated operating mechanism or movable parts to wear and be replaced. Fluor Cleaners can be furnished with different types of interior metal cones and screens, depending upon the characteristics of the gas being cleaned.

One of the outstanding features of the Fluor Cleaners is the fact that the pressure drop in both the moisture and dust remover is small. There is a minimum amount of resistance to the passage of the gas from the time it enters the Cleaner until it leaves.

N. Y. Consolidated Names Sellman Asst. Vice-President

Nils T. Sellman has been appointed Assistant Vice-President of the Consolidated Gas Co. of New York. He will be in charge of sales, utilization, and customers' service. He has been assistant secretary and director of sales and utilization of the company.

Mr. Sellman has long been a prominent figure in the gas industry. He has the distinction of being the first person to receive the Charles A. Munroe Award of the American Gas Association, which is generally considered to be the highest award in the industry. He has been active in all phases of gas utilization work and in the development of the automatic gas refrigerator.

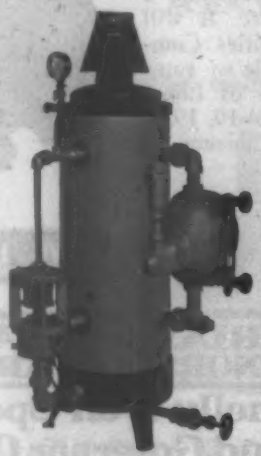
He reentered the employ of the Consolidated Gas Co. in March, 1919, continuing in the utilization department. In October, 1921, he was appointed service engineer of the American Gas Association and was later promoted to assistant secretary manager, devoting considerable time to the formation of the American Gas Association Testing Laboratory.

On January 1, 1925, he returned to the Consolidated Gas Co. as engineer of utilization. He was appointed assistant secretary of the company in February, 1928, and director of sales and utilization in 1929.

N. T. Sellman

Mr. Sellman has served on many important American Gas Association committees, including the Testing Laboratory Managing Committee of which he is secretary, and various research, industrial, and commercial committees. He was chairman of the Commercial Section from 1923 to 1933.

Pressing Machine and Steam Iron—
BOILERS



P. M. LATTNER MFG. COMPANY
CEDAR RAPIDS, IOWA

Penn Electric Names Two New Officers

On July 2, Albert Penn, President of the Penn Electric Switch Co., Des Moines, Iowa, announced the appointment of Nelson B. Delavan and Ben L. Boalt as vice presidents, effective immediately.

Nelson B. Delavan, who has been sales manager of the Penn Electric Switch Co. for the last five years, was named vice president and director of sales.

Ben L. Boalt, who has been in charge of heat control sales for the Penn Electric Switch Co. for the last four years, was named vice president in charge of the heat control division.

Other officers of the company are Ralph Penn, chairman of the board; Albert Penn, president and general manager; Malcolm Henning, vice president, and Paul E. Ford, secretary.

The company also announces the removal of its New York office from 33 West 60th Street to 15 Laight Street.

Report headquarters and New York office now are both located at this address. R. V. Clark, manager, and D. A. Coon, sales engineer, continue to represent the company in their New York office.

A. R. Rocke continues as manager at the export office, Leo deBarros as assistant manager and Douglas Pleasanton as engineer.

Pershall Elected Advertising Mgr. of P. U. A. A.

J. R. Pershall, of Chicago, advertising manager of the Public Service Company of Northern Illinois, was elected president of the Public Utilities Advertising Association at the annual convention of that organization in Chicago June 11. He

SELL GAS HEAT to the Small Home..

Check These Points

Easily Installed—Burns either natural or manufactured gas—Chain-Controlled from the Living-Room—or Fully Automatic With Customary Controls. (Thermostatic Equipment Extra.)

Many gas companies are selling the low-cost John Zink Conversion Burner to the small-home owner and the renter. Overcome the "first-cost" sales obstacle with this burner. Let us send you a test burner now—check its efficiency against that of any other burner!

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The Reliable Shut-Off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

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Greater DRY BOX PURIFICATION for the $ expended

LAVINO 'GRANULAR' OXIDE

LAVINO GRANULAR OXIDE is a standard Lavino Activated Oxide in a porous, granular form (made under a patented process). It requires no shavings or other carrying medium, but, on the contrary, each granule is entirely available for H_2S removal.

LAVINO GRANULAR OXIDE ACTUALLY SAVES MONEY because: It gives far greater purification for the dollar expended—Requires no mixing—Gives about 4 times the Box Capacity—Is easier to handle and fill boxes — Allows fouled material to be sold for Sulphuric Acid manufacture.

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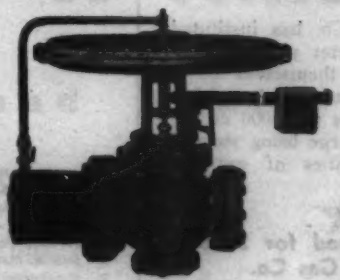

Fulton Low-Pressure Regulator

CF

THE Fulton Low-Pressure Regulator can be fitted with new valve seats if desired, with the body of the regulator remaining undisturbed in the line. Plain directions will be mailed to any user on request. This regulator is capable of taking relatively high inlet pressures and reducing to the correct pressure for use. If the purpose is to deliver a very low pressure, the diaphragm surface is made very large so that the regulator becomes highly sensitive to any variation at the outlet and adjusts itself to compensate. Action is exact, positive and sure. Changes of pressure on the inlet side are therefore without effect on the delivered pressure. If gas supply should fail, automatic cut-off is provided. This Regulator is easy to install, never sticks, gives unfailing satisfaction. One of a line of regulators for all needs of gas control which has been known and approved for forty years. Catalog on request.

The Chaplin-Fulton Manufacturing Co.

28-40 Penn Avenue Pittsburgh, Pa.

succeeds Henry Obermeyer of the Consolidated Gas Company of New York who was elected a director.

Mr. Pershall has long been active in the affairs of the Association, having served both as a vice-president and secretary. His experience in the utility advertising field extends from 1923 when he entered the advertising department of the Public Service Company of Northern Illinois. He has been advertising manager of that company for a number of years. Prior to coming into the utility field, the new president of the P.U.A.A was a member of the advertising department of Marshall Field and Company and a Chicago newspaper reporter.

McGowen Nominated for Second V. Pres. of A.G.A.

N. C. McGowen, of Shreveport, La., president of the United Gas Public Service Co., has been nominated as second vice-president of the American Gas Association for the term 1935-36, according to announcement made by the Association's Nominating Committee.

The complete slate of new officers for 1935-36 placed in nomination for the election to be held at the Association's 17th annual convention at Chicago, October 14-17, is as follows:

For President—L. B. Denning, of Dallas, Texas, president of the Lone Star Gas Company.

For Vice-President—Herman Russell, of Rochester, New York, president of the Rochester Gas and Electric Corp.

For Second Vice-President, N. C. McGowen, of Shreveport, La., president of the United Gas Public Service Co.

For Treasurer—J. F. Rooney, of New York, assistant to the vice-president, Consolidated Gas Co. of New York.

New Water Heater Meter Plan

The Key City Gas Co. has instituted a new water heater meter plan whereby consumers may avail themselves of a separate water heater meter at a minimum charge of 80 cents per 1000 cu. ft. per month with the charge being stepped down as larger quantities of gas are used.

McGowen Nominated for Second Chattanooga Gas Co.

A. B. Groesbeck has resigned his position as office manager of the Chattanooga Gas Co., and has accepted an administrative post with the United Gas Public Service Co. at Houston, Tex.

E. G. Petering was promoted from auditor to succeed Mr. Groesbeck as office manager, second ranking office in the utility here under A. J. Goss, vice-president and general manager. Chattanooga Gas is a property of United Light & Power.

K. W. Cash, Advertising Manager Penn Electric

K. W. Cash has been appointed advertising manager and sales promotion director of Penn Electric Switch Co., Des Moines, Ia., effective July 1.

Mr. Cash came to Penn Electric from a post as advertising manager of the C. E. Erickson Company, Des Moines. He was formerly connected with the Gardner Advertising Company, St. Louis, Mo., on copy and research, and with the Lessing Advertising Company, Des Moines, as copy writer.

Convention Calendar

September

17-19 Pacific Coast Gas Association, Pasadena, Calif.

October

14-18 American Gas Association, 17th annual convention, Palmer House, Chicago, Ill. Alexander Forward, managing director.

Standard Fuel Appoints New Representative

Standard Fuel Engineering Company of Detroit, Michigan, has recently appointed the E. B. Packard Company of 30 Church Street, New York City, as representatives for their ZERO Refractory Cements and allied refractories in the New York territory.

Twenty-Five Year Franchise Given The Oklahoma Natural Gas Company

On June 28th Oklahoma City voted the Oklahoma Natural Gas Company a twenty-five year franchise by a margin of 2,242 votes.

The company has operated since October, 1934, without a franchise. Throughout the campaign the company maintained the policy that "The Best Campaign Is No Campaign," and did not answer any attacks. In petitioning for a vote, the company said $200,000 worth of needed improvements could not be financed without the charter.

New Chart of Valve Comparisons

The Ohio Injector Company, Wadsworth, O., have issued a chart of valve comparisons. It shows a comparison of "O.I.C." numbers with those of other valve manufacturers. This chart is of particular interest to men responsible for valve maintenance and a copy may be had on request to the manufacturer.

J. CHESTER GREY

Chester Grey, president of the Atlantic City Gas Co., died June 30, at his Ventnor home. He was 54 years old.

Mr. Grey came to Atlantic City in 1925, as manager of the gas company. He was elected president July 1, 1930. Formerly he was connected with the Lansing Fuel and Gas Co., Lansing, Mich. He was born in Verona, Wis., and was graduated from the University of Wisconsin.

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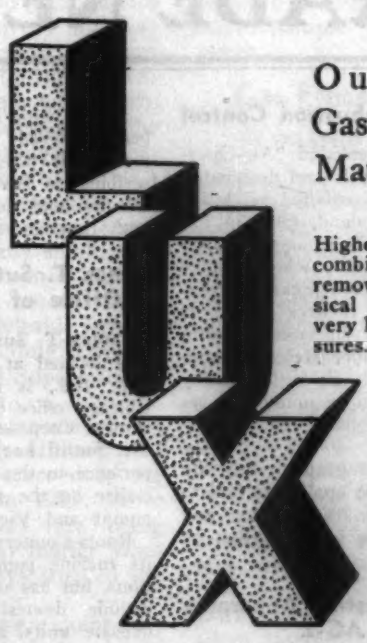

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Upper Sports Deck—where guests can take a sun bath in a bathing suit or enjoy deck sports.

CASINO ★ IN ★ THE ★ AIR . . . *New York's largest open air Restaurant*

TRADE NEWS

Air-Operated Combustion Control

A 32-page bulletin entitled "Air-Operated Combustion Control" and designated as No. 102, is being distributed by Bailey Meter Company, Cleveland, Ohio.

This bulletin describes a complete combustion control system which automatically maintains steam pressure, combustion efficiency and furnace draft. It explains in detail how the system ties in with the company's Boiler Meter to automatically readjust fuel—air ratio thereby maintaining combustion economy and reducing furnace maintenance to a minimum.

Diagrams and photographs illustrate how the system may be applied to boilers ranging in size from 200 h.p. up, and fired either with fuels in suspension or with stokers.

Laboratory Gas Testing Apparatus Bulletin AG-2

American Meter Company, 60 East 42nd Street, New York, recently issued a Laboratory Gas Testing Apparatus Bulletin AG-2. This bulletin completes a new series of six apparatus bulletins. It describes and illustrates the following products:

AG-1. Meter Provers, including the new Fine Reader and Rapid Meter Testing Apparatus, Cubic Foot Bottles, Hydropneumatic Meter Testers.

AG-2. American Calorimeter, Sulphur and Ammonia Test, Hydrogen Sulphide Test, Specific Gravity Apparatus.

AG-3. Wet and Dry Test Meters and Demonstration Meters for numerous applications.

AG-4. Recording and Indicating Demand Meters.

AG-5. Protector Siphon Gages, Single Tube Pressure Gages and High Pressure Differential Gages.

AG-6. Service Cleaners, including Drip Pumps, the New American Service Cleaner and the Providence Vacuum Tank.

Roper Inaugurates New Display Service

Definitely feeling the dealer need of a continuous display service the Geo. D. Roper Corporation announces a new display policy.

Four times yearly a completely new display is to be sent to those companies subscribing to the service. This affords a new display set carrying a timely message and illustration for each season of the year.

The first of the newly announced yearly series is a display emphasizing summer and fall pastimes made possible by the time saved in using a modern gas range. The following sets will be distributed for the winter holidays, early spring and early summer. Each to illustrate a dominant feature of the modern gas range.

Due to wide distribution this service is being offered at a very nominal fee, making it possible for companies subscribing to have a variety of attractive window and floor displays while saving both time and expense.

James T. Sutliff Now at Chicago Office of Roots-Connersville

James T. Sutliff, who for many years was located at the factory in Connersville, Ind., is now associated with the Chicago office of the Roots-Connersville Blower Corp. at 20 North Wacker Drive. Mr. Sutliff has had a great deal of experience in the pump field, and will specialize on the sales of Type 'T' turbine pumps and Victor-Acme blowers.

Roots-Connersville originally developed its turbine pump for industrial applications, but has now expanded this line to include domestic water systems, condensate units, and volatile liquid pumps for handling hazardous liquids. Combining rotary positive and centrifugal advantages, these pumps are especially suited to handling comparatively small quantities of liquids at the higher heads. Capacities range from 5 to 300 GPM at heads up to 500 feet in standard sizes.

New Thermometer Catalog

A striking new Industrial Thermometer Catalog has just been issued by the C. J. Tagliabue Mfg. Co., of Brooklyn, N. Y. The catalog (No. 1125) contains 24 pages of conveniently arranged listings of the complete TAG Line of Industrial Thermometers, Miscellaneous Metal and Woodback Thermometers, Hygrometers, U Gages, Mercurial Vacuum Gages and Mercurial Barometers.

The company will send a copy on request.

New Booklet on Welder Piping Issued

Air Reduction Sales Co., Lincoln Bldg., N. Y., have issued a new booklet entitled "The Facts About Welded Piping for Buildings." The booklet was planned to interest architects and heating engineers and plant executives responsible for piping installations. It is well illustrated with photographs of typical installations.

New Diesel Bulletin

A new bulletin just issued by The Cooper-Bessemer Corporation, Mt. Vernon, Ohio, is entitled "Type GA Single and Twin Cylinder Horizontal Diesel Engines," and describes a Diesel Engine of 25-110 B.H.P. specifically developed for stationary service for the smaller power user.

Chief features are low fuel consumption, quick access to moving parts, die-forged crankshaft and connecting rods, simple fuel injection system, and improved cylinder construction.

The bulletin points to the many industrial applications of these engines, such as driving electric generators and furnishing power for ice plants, flour and feed mills, cotton gins, textile mills, the oil fields, and irrigation pumps.

Copies of the bulletin are obtainable upon request.

A G-AO single cylinder two-cycle Cooper-Bessemer engine installation

Life Sentence for Davis Bros.

(*Continued from page 18*)

1906, he came across a meter badged "Samuel Downs and Son" and stamped inside, Inspected by W. H. Brown, 1860.

In those days when a town became large enough to support a gas company it was the custom for the bankers and merchants of the town to pool together and form a company, which usually paid well until repairs and replacements became necessary. Such expenses were disregarded by the owners due to lack of experience in this line, then earnings would fall off, caused principally by neglect of the meters. Nevertheless, to secure a contract in such cases, a traveling meter man had a selling job on his hands and would sometimes, in order to secure a contract, have to produce evidence of his ability to restore dividends by testing and stripping a number of meters, thereby, exposing the actual conditions and then while in the act of raising the dividends the consumers would be in the act of raising "Hell," and declaring that the meters removed from their premises were correct and the new installed meters were fast. In a town where Billy Sunday was holding a revival they changed the meter at his tabernacle and doubled his gas bill. He hit the sawdust trail and landed in the Meter Shop hollering, Why pick on me?

The meter man replied, "I treat all consumers alike." "How many consumers, have you," he asked. "Ten thousand," said the meter man. "You had better join my church in self-defense, for if you treat them all like you treat me, there are ten thousand people praying for you to go to hell," which is another very good reason why gas companies should retain the accuracy of their meters, especially in this day when good public relationship is of such *vital importance;* however, let it be said to the credit of the gas industry that during all the years spent by the Davis Brothers in repairing meters there was never a suggestion on the part of officials to set meters to register unfairly in favor of the gas company.

In 1903, New Orleans, Louisiana, was the only City in the United States still using wet meters, and J. R. and R. E. Davis were employed in making the change-over to dry meters. In 1905 yellow fever broke out, and so did everybody else, who could get away.

About this time, holding companies were becoming active and one of the first things they would do after taking over an old plant, would be to make a meter survey and correct domestic measurement, and thus a proposition, which the local owners were glad to unload, would turn out to be a paying investment for the new owners. And through efficient operation they were able to render a higher type of service and give better rates. Say what they may about the "Chain-Gang," many small communities would not be enjoying gas service today, were it not for them.

And it might be advisable here to mention that every holding company should have a General Supervisor of Domestic Registration.

After finishing up various plants, for the Dawes, Childs Hulswit and others, the Davises returned to the New Orleans plant in 1907. *Note* the old gas house was now being called "Plant," but no matter what they called it, it always smelled the same.

At this time they were joined by their younger brother, Pat, who in 1909, with R. E. Davis, overhauled the meter system at Houston, Texas, then 7,000 meters (but now approximately a 100,000). Since then until now, Pat Davis has supervised Meter Maintenance in San Antonio, Texas, while R. E. Davis remained in Houston, Texas, and J. R. Davis has retired at San Antonio, Texas. And if you ask him why he did not aspire to be General Manager or President of a gas company he will tell you, he preferred something offering more contentment, and a job that is as important as any in the gas industry.

Oldest Employee Awarded Emblem

John H. Martin of Watervliet, N. Y., oldest employe of the New York Power and Light Corporation, was given opportunity to observe his diamond jubilee of employment June 17th when veteran employes formed into the corporation's Twenty Year Club, honored him. The club directors called at his home and officially presented him a 75-year service emblem as well as a purse from members of the club.

In the summer of 1860, Mr. Martin became employed by the West Troy Gas Company. He was then only 12 years old.

Speaking of the early days, he says, "I had a small ladder and torch, and seven nights a week I lit the lamps and at 2 o'clock in the morning I again made the rounds to turn them off. This happened every night except on bright moonlights, when the street lights were unnecessary. Several times a week I took a wheelbarrow with two cans of kerosene and filled and cleaned all the oil lamps. The pay was $15 a month.

Gas Pressure Controls

(*Continued from page 21*)

however may be practically eliminated or at least minimized by extending the static line so that its inlet is beyond the immediate influence of conditions existing in the valve chamber or only a short distance beyond the regulator and sealing the diaphragm from the valve chamber.

Ice Formation

Ice forming on or near the valves of a regulator may occur regardless of orifice sizes or rates of flow wherever there is sufficient moisture or condensate in the gas and temperature conditions are favorable to freezing. As explained by natural laws heat is absorbed by any gas when expanding. In a regulator the available sources of heat are the heat content in the gas and the parts of the regulator and that which may be conducted through the metal parts of a regulator from the atmosphere or some provided source of heat. In extreme cases the lowering of temperature may be sufficient to freeze the natural constituents of gas in addition to any vapors. Freezing of vapors may occur even in warm climates where the pressure change across the regulator is of a sufficient quantity, such freezing having occurred in the summer weather of semi-tropical sections with 150 pounds differential. On the east coast of the United States and also under winter conditions the vapor in gas froze where the differential in pressure across the regulator was only twenty pounds and at flows less than ten percent of the regulator capacity. The reason for freezing with the latter conditions is usually difficult to ascertain especially where the gas had been transmitted more than twenty miles and pressures decreased ten pounds over that distance. Other regulators of identical design installed at the same location and functioning under almost identical conditions have never been known to freeze.

Gums and tar often cause a condition similar to freezing but in this case temperatures above freezing may produce the difficulty without any differential in pressure as a lowering of temperature would increase the viscosity of the gums or tar to a point where the proper functioning of the regulator would be interfered with.

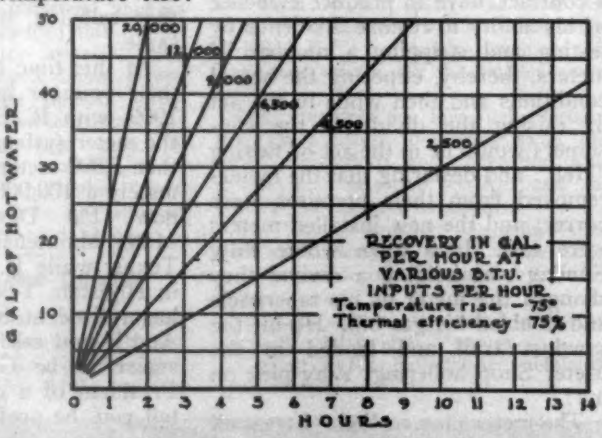
Domestic Gas Utilization

(*Continued from page 32*)

It is important to note that in the last three charts a heater of only one size (40 gal. storage), has been given consideration. It is self evident that equal hot water service can be rendered by a small storage, quick recovery heater as compared with a large storage, slow recovery heater. For any given schedule of water withdrawal considerable judgment is required in the proper selection, a subject discussed in a latter article. However, the comparison between the relative gas consumptions for say a 30 gal., 4,500 Btu. input heater and a 20 gal., 20,000 Btu. input heater, assuming for a moment that equal service can be supplied from each at the same storage temperatures, is a problem frequently pondered. The question is that of the much fought over battle ground of the quick versus the slow recovery type of heater. And, like most other phases of the water heater subject, this relative gas consumption is susceptible to analysis under any given set of conditions. First, we know that the extent of the exterior and the flue surface conditions the rate of heat loss from a heater and further, that the area of the tank surface is dependent on the volume of water storage. The question, then, is the heat loss during standby periods of equal duration from, say, a 30 gal. storage heater greater than from a 20 gal. heater—if so, how much? This rate of heat loss varies, of course, with the type, the construction and with the manufacturer. The surface area naturally depends upon the dimensions of the tank which, geometrically, is a hollow cylinder with two closed ends. It is noteworthy that the area of the bottom and of the top vary as the square of the radius, while that of the side varies directly as the radius and the length. This might appear a shade academic, but taking a concrete case will emphasize the importance.

One manufacturer's standard tanks—30 gal., diameter 16.5", length 35"; 20 gal., diameter 14", length 51.5"—present areas for the 30 and the 20 gal. heaters, respectively, of 15.54 sq. ft. and 11.76 sq. ft., or 3.78 sq. ft. less for the 20 gal. heater. This difference in area indicates that the 30 gal. tank has a 32% greater rate of heat loss through the walls and ends than the 20 gal. heater at the same average water temperatures. This sacrifice in lost heat must be made in order to gain a 50% greater water storage capacity, but it is significant to observe that the percentage in the rate of lost heat is not directly proportional to the percentage of increased water storage for these particular tank dimensions.

Although the higher rate of heat loss from the larger storage capacity heater is self-evident, the relative total number of hours of standby is also a factor of equal importance. To show the hot water recovery in number of gal. per hr. with various rates of hourly Btu. input the following chart is presented for a fixed 750° temperature rise:



Quick and Slow Recovery

In comparing the quick with the slow recovery automatic storage heater, the theoretical fundamentals brought out in this chart are most important.* Inspection will establish that with a 2,500 Btu. hourly input 30 gal. of hot water requires a recovery time of 10 hours, whereas with 20,000 Btu. hourly input the same volume of water requires 1.25 hours. The difference in the time of recovery caused by the different rate of heat input is 8.75 hr. which, in the final analysis, represents the increased number of hours in which standby losses are occuring with the higher input heater. Therefore, it can be said in actual practice that although slow recovery necessitates a larger storage, which involves an increased rate of heat loss, the substantially greater number of hours of standby loss with the quick recovery heater tends to offset the heat losses of the larger storage required incident to rendering comparable hot water service.

General Formula

For convenience the following general formula is introduced to facilitate determination of the recovery

**Service men are frequently prone to setting up the thermostat to overcome deficiencies in service caused by either insufficient storage or recovery capacity instead of increasing the heat input. Of the two evils better judgment dictates election of greater Btu. input.*

*From either of these two charts take a 125°F. setting, a 50°F. inlet (hence 75°F. rise) and 1,200 gal. per mo. water consumption (or 40 gal. per day which, multiplied by 75°F., is 3,000 Btu.-gal.), the monthly gas is 2,365 cu. ft. as shown on each chart.** Raising 1,200 gal. another 15°F. to a 140°F. setting, then the necessary absorbed heat is:*

8.33 × 1,200 × 15 = 150,000 Btu. must be absorbed (or added to the heat content of the water).

At an assumed thermal efficiency of 75% while burning:

$\frac{150{,}000}{.75}$ *= 200,000 Btu. must be applied to raise the volume of water through 15°F.*

With 540 Btu. gas, then:

$\frac{200{,}000}{540}$ *= 370 cu. ft. of gas must be burned to raise heat content an additional 15°F. up to 140°F.*

Obviously, if there were no extra heat loss due to this 15°F. higher storage, the gas consumption would be only that required to raise the water through the extra 15°F., or 2,365 + 370 or 2,735 cu. ft. But the "fixed inlet" chart indicates that at a 140°F setting which, having a 50°F. inlet, makes a 75 + 15 = 90°F temperature rise, the gas consumption is 3,080 cu. ft., then:

3,080 — (2,365 + 370) =

3,080 — 2,735 = 345 cu. ft., which is the gas required to offset the increased thermal loss caused by carrying the storage at 140°F. instead of at 125°F., assuming only a 75°F. rise in either case.

Now, then, it can be deducted that 2,365 + 345 or 2,710 cu. ft. will be the monthly gas required if 1,200 gal. of water per month had a 75° F. temperature rise to a 140°F. thermostat setting instead of the same temperature rise to only a 125 F. setting—and, lo and behold, on the Btu.-gal. chart, the monthly gas consumption is 2,710 cu. ft. Then, in conclusion, it can be definitely stated that 345 ÷ 2,710 or 12.7% is the added cost of carrying water having had the same rise (added heat content) at a 140°F. instead of at a 125° F. storage at the particular rate of water withdrawal shown. The same process can be gone through to demonstrate that with the same water withdrawal the gas consumption is 21.1% greater at a 155°F. than at a 125°F. storage at the same temperature rise.

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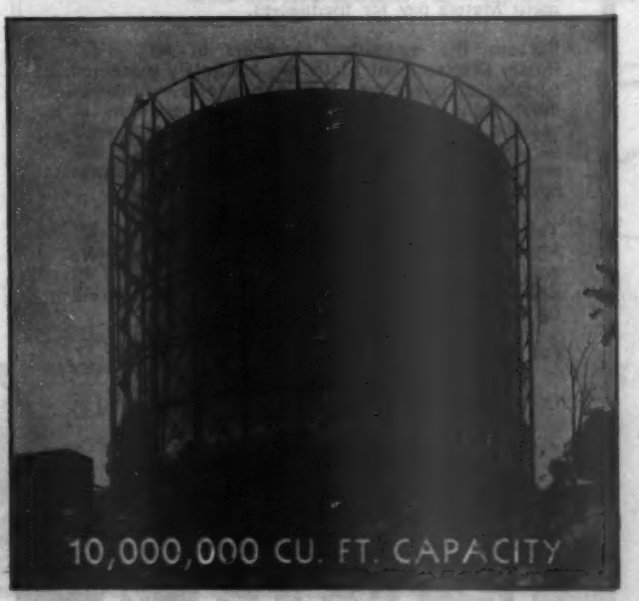

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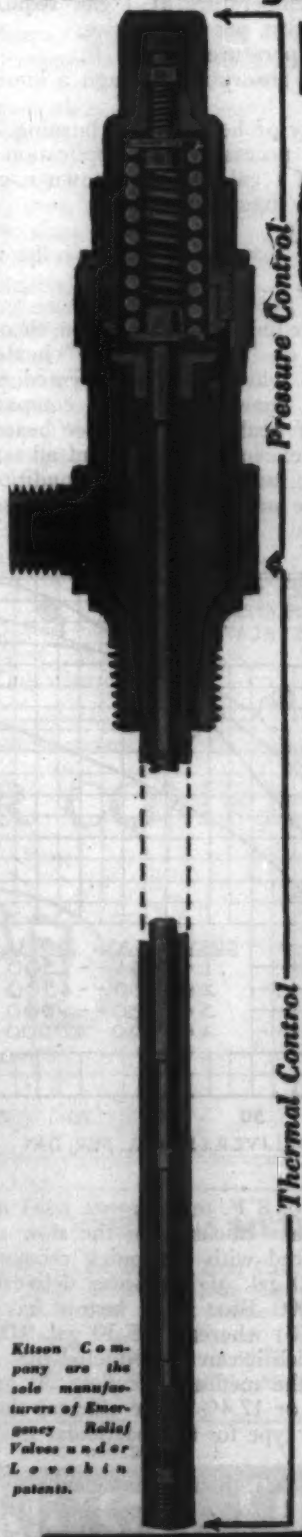


PREVENTS

Excessive Temperatures as well as danger from Water Expansion Pressures

Why is Temperature Relief necessary?

No mere pressure relief valve can prevent excessive temperatures in a water heater, under all operating conditions. In a closed system, pressure relief is necessary to provide for the natural increase in the volume of water when heating, but this pressure relief is *not*, in itself, sufficient to prevent serious trouble, should the water temperature continue to rise.

To be absolutely sure, it is necessary to *prevent* the temperature of the water reaching a point where (at the pressure within the tank) steam can be generated.

In principle and in design, the Kitson temperature controlled valve operates unfailingly when the temperature condition becomes dangerous, no matter what the pressure conditions might be.

Send for Literature describing our Complete Line of Safety Devices for Domestic Water Heaters.

Kitson Company are the sole manufacturers of Emergency Relief Valves under Lovekin patents.

Kitson also manufactures Ground Key Stops for Gas and Water, and Brass Plumbing Products.

KITSON COMPANY
261 No. BROAD ST
PHILADELPHIA PA.

(Established 1897)

capacity of a heater at a known rate of Btu. input, efficiency and temperature rise:

Since to raise the temperature of 1 gal. requires the absorption of 8.33 Btu. per degree rise,

Letting y = the temperature rise in °F,

Then $8.33\ y$ = Btu. absorption through a known rise,

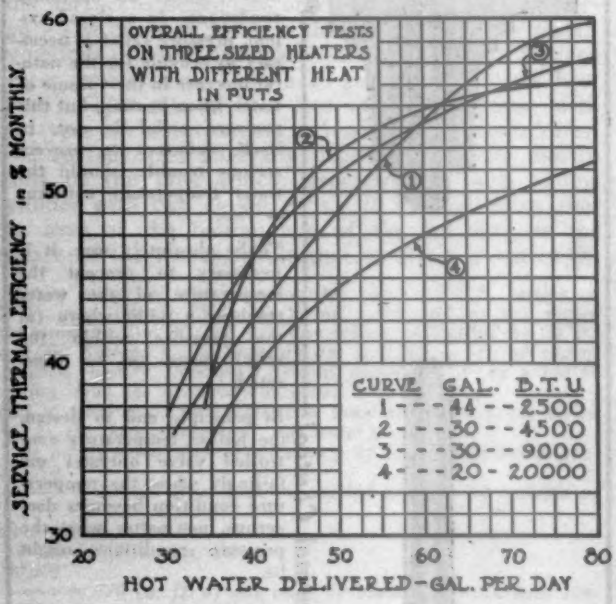
Letting z = efficiency of heater while burning,

Then $8.33\ y \div z$ = necessary heat application to increase temperature of 1 gal. through known rise

Letting x = the Btu. input per hr.,

Therefore $x \div \frac{8.33y}{z} = xz \div 8.33y$ = the recovery capacity in gal. per hr.

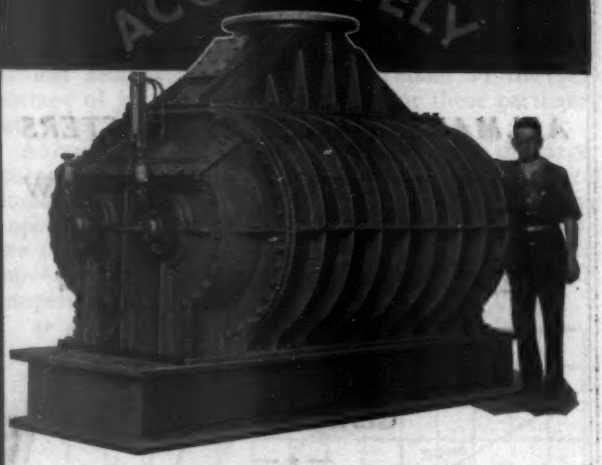
Interesting as the preceding observations on theory might be, demonstration on "flesh and blood" heaters is more to the point—to which end is presented the following dramatic chart, showing an actual comparative test on four rates of heat input on three heaters of identical construction, except as to size, and all tests conducted simultaneously under the same conditions (63.8°F. temperature rise and 140°F. thermostat setting):



The foregoing curves (63.8°F. temperature rise) indicate the markedly increase efficiency of the slow recovery heaters as compared with the quick recovery type. For example, at 50 gal. of hot water delivered per day, the 20 gal.-20,000 Btu. input heater has a service efficiency of 44.3%, whereas the 30 gal.-9,000 Btu. has 52.0%, from which it can be deducted that at this rate of withdrawal the medium recovery 30 gal. is (52.0 — 44.3) ÷ 44.3 or 17.4% more efficient than the quick recovery, 20 gal. type for this particular make of heater.

Why the large storage heater with extremely slow recovery, namely, Curve 1 for a 44 gal.-2,500 Btu. input, is apparently less efficient than the 30 gal. size with 4,500 and 9,000 Btu. inputs, respectively Curves 2 and 3, it is difficult to explain—in fact, theory would indicate a reverse relationship. Less favorable dimension proportions and flue baffling of the larger size heater might cause the inconsequentially small difference. However, the important fact remains that these tests establish that because of the greater number of

METERS
ALL VOLUMES
ACCURATELY



In metering large volumes of gas, the loss resulting from even a fractional error runs into money quite rapidly. Reducing that error to a negligible amount is one of the ways in which "R-C" Rotary Displacement Meters pay for themselves.

Because the measuring chambers in an "R-C" Rotary Displacement Meter are accurately machined surfaces of heavy cast iron, accuracy is maintained indefinitely and is not affected by variations in specific gravity, moisture or impurities, nor by wide variation in rate of flow. Important, too, is low pressure absorption—normal differential pressures not exceeding 1 inch water column.

This high degree of accuracy is maintained in "R-C" Meters over a wide range of meter sizes. Meters are available in capacities ranging from 1,000 to 2,000,000 cu. ft. per hour, at line pressures ranging up to 300 pounds per sq. in.

For complete data, ask for Bulletin 40-B10.

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5	SAME HEATER AS NUMBER 4 WITH INPUT ADJUSTED	2.5	30	3800
6	REVERTIBLE FLUE SLOW RECOVERY	5.5	45	3830
7	INSTANTANEOUS, 3 GAL. PER MIN.	125.0	45	3840
8	UNDERFIRED QUICK RECOVERY TYPE AT ½ INPUT RATING	10.7	20	3910
9	MULTI-FLUE QUICK RECOVERY	25.0	22	4190
10	SINGLE INTERNAL FLUE QUICK RECOVERY	25.0	38	4330
11	CONVERSION SLOW RECOVERY	4.2	30	4390
12	SAME HEATER AS NUMBER 8 AT STANDARD RATING	20.0	20	4570
13	CONVERSION SLOW RECOVERY	3.2	30	4970
14	SIDE ARM QUICK RECOVERY	30.0	32	4970
15	SIDE ARM QUICK RECOVERY	21.0	32	5370
16	SAME AS NO. 11 EXCEPT WITH UNINSULATED TANK	4.2	30	5960

0 1000 2000 3000 4000 5000 6000

CU. FT. (535 Btu.) GAS MONTHLY

hours of standby in which heat is escaping from the stored water up through the flue, the quick recovery automatic storage heaters now generally on the market for average domestic business are thermally less efficient to an appreciable extent than the medium and slow recovery type.

The automatic storage as a type has been demonstrated to be substantially less costly in operation than any other type now manufactured for the general domestic field. This coupled with a reasonably low initial cost has established rather broad acceptance. It is recommended that any one interested in the comparative efficiencies of other automatic types, such as the instantaneous, the side-arm storage and the conversion "strap-on", procure and study the recent M.I.T. data entitled "Final Report of Comparative Water Heater Tests" published through the American Gas Association.*

The authenticity, accuracy and the unbiased nature of the source gives rise to the belief that these reports will have a marked effect on the industry, both manufacturer and distributor. Several definite conclusions can be drawn from this diagram, namely:

a.) The low heat input storage type offers the greatest economy.

b.) The conversion heater imposes on the customer a greater operating cost (approximately 27% more gas being required than with the most efficient gas-designed low recovery) although the conversion type is roughly equal to the regular quick recovery type. However, the general design of the conversion type doubtless will cause greater decrease in efficiency in a period of time.

c.) The side-arm quick recovery is by a considerable margin the least efficient of all types tested.

d.) The instantaneous type produced fairly creditable results although the fact that there were only ten withdrawals per day distinctly favored this type of heater (the frequent withdrawals of small quantities as encountered under actual field practice in the average home measurably decreasing the efficiency of the instantaneous type).

e.) Rather startling differences in efficiency exist between heaters of essentially the same size and input depending upon the manufacturer.

**The essence of the M.I.T. tests on gas heaters, conducted for A.G.A. is summarized in the tabular diagram above showing the monthly gas consumption of various sizes, types and ratings of standard models of automatic heaters, each heater being ranked according to respective economy at a withdrawal rate of 50 gal. per day through a 100° F. rise.*

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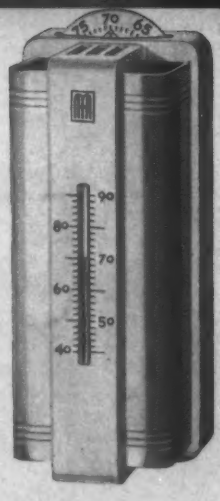

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